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ACTION OF ARSENIC UPON THE FIXED SULPHYDRYL GROUPS OF PROTEINS

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The relationship of the pharmacological action of arsenic to sulphydryl compounds was first demonstrated by Voegtlin, Dyer, and Leonard in 1923 (1). These investigators showed that the toxic effects of arsenious oxides upon trypanosomes *in vivo* and *in vitro* could be prevented by amorphous reduced glutathione, cysteine, and related SH compounds. It was also shown that death in the rat from a lethal dose of arsenic could be offset by such compounds (2), particullarly amorphous glutathione. The corresponding disulphide compounds had little or no effect, and various amino acids (containing no SH group), lecithin, glucose, and inorganic salts were without effect.

These observations were confirmed by Rosenthal and Voegtlin (3) employing crystalline SH glutathione. It was further shown that the local inflammatory action of arsenoxide could be prevented, and chemical evidence was also presented to show an interaction between SH glutathione and arsenious oxides.

Voegtlin, Rosenthal, and Johnson (4) have recently studied the effect of various trivalent and pentavalent arsenicals upon the oxygen consumption of tissues and yeast cells *in vitro*, by means of the Warburg microrespiration apparatus. Only the trivalent arsenic compounds were found to reduce the oxygen consumption, and it was possible here again to prevent this action by crystalline SH glutathione, while S–S glutathione was without effect.

Since glutathione is a physiological constituent of living cells, these experiments have definitely established a relationship between the biological action of arsenic and glutathione. The possibility was suggested by Voegtlin, Dyer, and Leonard (1) (2), and in later publications, that arsenic might react with other sulphydryl compounds of protoplasm such as proteins. The present work deals with this question of a combination of arsenic with the fixed sulphydryl groups of native and denatured proteins. It has been possible to demonstrate such a reaction by three different methods of approach—physicochemical, chemical, and biological.

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Little is known of the constitution, distribution, and significance of the "fixed" sulphydryl compounds in tissues. Heffter (5) demonstrated that a positive nitroprusside test as an indication of sulphydryl compounds was given by many plant and animal tissues. Upon the discovery of glutathione, Hopkins (6) thought that this substance was mainly responsible for the presence of this test; but Hopkins and Dixon (7) later observed that after all the glutathione was washed from muscle, an insoluble residue remained which still gave a strong nitroprusside reaction. To the substances responsible for this reaction they gave the name "fixed SH groups." The fixed sulphydryl groups were resistant to extraction with boiling water, alcohol, ether, and acetone. They were comparatively stable in air, but were thought to be susceptible to reversible oxidation reduction by other SH or S–S systems (8). Very little in addition has been added to our knowledge of the fixed sulphydryl systems *as they occur in the native tissue proteins.* Hopkins and Dixon (7) worked principally with muscle proteins that had been denatured by heat and alcohol, although they also demonstrated the presence of sulphydryl groups in the native muscle proteins freed from glutathione. By the dialysis of tissues until the glutathione is removed, we have found that various organs contain fixed SH groups in their native proteins. This observation lends practical significance to the experiments herein reported. As shown by Heffter (5) and studied in detail by Harris (9) many native proteins develop sulphydryl radicals when subjected to denaturation. Abderhalden and Wertheimer (10) showed that such a system in denatured egg albumin is susceptible to oxidation by cystine. Recently Mirsky and Anson (11) have attempted to estimate quantitatively the sulphydryl groups in denatured proteins.

PHYSICO-CHEMICAL EXPERIMENTS ON THE COMBINATION OF ARSENICALS WITH PROTEINS

Arsenoxide (3–amino–4–hydroxyphenyl arsenious oxide) was used as a source of trivalent arsenic, and the corresponding 3–amino–4–hydroxyphenyl arsonic acid was used as a pentavalent arsenical. We are indebted to Dr. J. M. Johnson of this laboratory for their preparation. It was previously found by Rosenthal and Voegtlin (3) that arsenoxide could be titrated with iodate by the Okuda method, and this method was employed for estimating arsenoxide in protein-free filtrates. The pentavalent compound, of course, gave no iodine titer, and its presence was estimated by the Gutzeit method, after a preliminary ashing of the material at 600° to 650° C. in the presence of potassium carbonate.

Collodion sacs were prepared from an 8 per cent collodion solution in 70 parts of alcohol and 30 parts of ether. The inner surfaces of pyrex test tubes were heavily coated with this solution and allowed

to dry in air for 30 minutes. The sacs were then detached with water, tied to large glass tubes, and arranged for purposes of ultrafiltration under air pressure of 60 to 90 mm. of mercury. A neutral solution of arsenoxide was added to various proteins to make the final concentrations 0.001 molar. The ultrafiltrates of these solutions were shown to be protein free. The first cubic centimeter or so was discarded, and arsenic determinations were done upon samples collected later.

The results of such experiments are shown in Table 1. A striking relationship exists between the presence of sulphydryl groups in the proteins and their ability to combine with trivalent arsenic and hold it back from the ultrafiltrate.

Fresh egg white (nitroprusside test negative) was diluted with equal parts of 0.8 per cent sodium chloride solution. It was shown that the protein-free ultrafiltrate of this solution did not give a titer with iodine. To one portion of this egg white (6 per cent protein) arsenoxide was added and the solution placed in the ultrafilter. After collection of sufficient ultrafiltrate for iodometric titration of the arsenic, the sac was thoroughly washed. The other portion of egg white was now coagulated by immersion in boiling water for two minutes and cooled under tap water. The coagulated protein gave a strong nitroprusside test for sulphydryl radicals. The same concentration of arsenoxide as that used in the preceding experiment was added to the coagulated egg white and ultrafiltered in the same collodion sac. While 92 per cent of the arsenic came through in the ultrafiltrate from the native egg white, no arsenic was demonstrable in the filtrate from the egg white which had been coagulated to bring out the SH groups.

TABLE 1.—*Ultrafiltration experiments demonstrating that proteins combine with "arsenoxide" only when they contain sulphydryl groups*

Solution in filter	Concentration of arsenic in ultrafiltrate
	Per cent
Fresh egg white diluted with equal parts of 0.8 per cent NaCl+0.001 molar arsenoxide (pH 7.8)	92
Egg white coagulated (100° C. for 2 min.)+0.001 molar arsenoxide (pH 7.8)	0
2.1 per cent solution of crystalline egg albumin+0.001 molar arsenoxide (pH 7.6)	100
2.1 per cent solution of crystalline egg albumin coagulated (100° C. for 2 min.)+0.001 molar arsenoxide (pH 7.6)	0
1.06 per cent solution of ovoglobulin+0.001 molar arsenoxide	97.5
1.06 per cent solution of ovoglobulin coagulated (100° C. for 2 min.)+0.001 molar arsenoxide	83
1.72 per cent solution of casein+0.001 molar arsenoxide (pH 7.3)	96.5
5 c. c. rabbit serum+15 c. c. 0.8 per cent NaCl+0.001 molar arsenoxide	100
5 c. c. coagulated serum (100° C. for 2 min.)+15 c. c. 0.8 per cent NaCl+0.001 molar arsenoxide	90

Equally clear results were obtained from a 2.1 per cent solution of crystalline egg albumin (once recrystallized and dialyzed two days in tap water to remove the ammonium sulphate). The native albumin combined with none of the arsenic, for it appeared in the ultrafiltrate in 100 per cent concentration, while the coagulated albumin combined with 94 per cent of the arsenic (6 per cent in the filtrate). Calculations reveal that on a basis of these results, 1 gram of coagulated crystalline egg albumin combined with 11.81 mg. of arsenoxide.

Ovoglobulin was prepared by precipitation with half-saturated ammonium sulphate, redissolving and reprecipitation by dialysis in running water for two days. It was finally dissolved in 0.8 per cent salt solution. A 1.06 per cent solution of the native globulin combined with 2.5 per cent of the added arsenic while the coagulated globulin combined with 17 per cent. At first it was believed that these results indicated a weaker combining power for globulin than for coagulated egg albumin, but further study revealed that the sulphydryl groups brought out by heat coagulation of ovoglobulin are relatively unstable, rapidly undergoing oxidation in contact with air so that the nitroprusside test becomes negative after a 1 to 2 hours' standing. By the time that the arsenic was added to the coagulated globulin some of the sulphydryl groups had oxidized, and the resulting disulphide compounds were not able to combine with the arsenic. That the combining power of the sulphydryl groups of coagulated globulin is as great as, or greater than, that for albumin will be demonstrated in the chemical experiments presented here. The sulphydryl groups in egg albumin are much more stable and under similar conditions the nitroprusside test will remain positive for many days.

Casein was selected as a denatured protein which contained no sulphydryl radicals. A casein powder that had been purified by washing for 12 days with 0.2 per cent acetic acid was brought into solution by standing overnight in lime water. The next day it was filtered through filter paper and the filtrate containing 1.72 per cent casein was employed. The ultrafiltrate from this solution contained 96.5 per cent of the added arsenic.

Blood serum was taken as another protein solution considered to give a negative nitroprusside reaction following heat coagulation (Heffter (5), Harris (9) Hopkins (8)). Native rabbit serum (diluted 1 to 4) combined with no arsenoxide, 100 per cent appearing in the ultrafiltrate. Heat-coagulated serum combined with 10 per cent of the added arsenic. This, however, can most likely be explained by the presence of sulphydryl groups; for, contrary to the previous observers, we found that serum (rabbit, dog, chicken) coagulated as previously described, develops a weak but definitely positive nitroprusside reaction which persists for 10 to 30 minutes. Some highly unstable sulphydryl groups are evidently liberated which oxidize very rapidly.

Experiments were next performed upon tissue proteins. A thermostable muscle powder was prepared according to the method of Hopkins and Dixon (7) by extracting rat muscle with boiling water, washing 20 times in distilled water, and thoroughly extracting the residue with alcohol and ether. One gram of this powder (which gave a strong nitroprusside test) suspended in water combined with 93 per cent of the added arsenoxide. A solution of arsenoxide in water as a control showed 100 per cent diffusibility, as evidence that in these experiments none of the arsenic was held back by the collodion sac. (Table 2.)

TABLE 2.—*The ability of tissues with fixed sulphydryl groups to combine with arsenoxide (ultrafiltration experiments)*

Solution in filter	Concentration of arsenic in ultrafiltrate
	Per cent
15 c. c. of 0.001 m. arsenoxide	100
15 c. c. of 0.001 m. arsenoxide+1 gram muscle powder	7
25 c. c. 0.001 m. arsenoxide	100
7 grams minced rat liver (washed 14 times)+25 c. c. 0.001 m. arsenoxide (pH 6.8)	25
20 c. c. of 0.001 m. arsenoxide (pH 7.6)	100
2 grams rat testes dialyzed for two days+0.001 m. arsenoxide (pH 7.6)	64

The liver freshly removed from a rat was thoroughly minced with fine scissors and washed (by centrifugation) 14 times with Locke's solution (pH 7.7). The last washings gave a negative nitroprusside test, while a test on the extracted liver tissue was still positive. Seven grams of the washed liver were added to 25 c. c. of 0.001 molar arsenoxide and placed in the ultrafilter. The concentration of arsenic in the ultrafiltrate revealed that 75 per cent of the arsenic had combined with the liver. (Table 2.)

Two grams of rat testes were minced with fine scissors, and dialyzed in running tap water for two days. At this time the nitroprusside test upon a trichloracetic acid extract of the testes was negative, showing that no reduced glutathione was present. The test upon the dialyzed testes was still strongly positive. The tissue was now diluted with water and arsenoxide was added to make a 0.001 molar solution in a final volume of 20 c. c. Upon ultrafiltration it was shown that 36 per cent of the arsenic had combined with the testes. (Table 2.)

The facts that (*a*) only those proteins containing sulphydryl groups combine with appreciable amounts of arsenoxide; (*b*) that proteins that have been coagulated and their colloidal surfaces thereby greatly reduced combine with arsenoxide, while (*c*) the same native proteins that contain no SH groups do not, give evidence that such a combination is a chemical reaction and not a question of surface adsorption.

Further proof that this union involves a chemical reaction between the trivalent arsenic and sulphydryl groups is shown in experiments with 3-amino-4-hydroxyphenyl arsonic acid, having the same molecular structure as arsenoxide except that the arsenic is in the pentavalent form. An ultrafiltration experiment performed upon a freshly prepared 2.1 per cent solution of recrystallized egg albumin under conditions identical with those of arsenoxide, revealed that the pentavalent arsenical combined with none of the albumin, either in the native state or after heat coagulation, 100 per cent concentrations appearing in the ultrafiltrates in both cases. (Table 3.) The ultrafiltrates as well as the original solutions were diluted 1 to 10 for the arsenic determinations by the Gutzeit method.

TABLE 3.—*The inability of the fixed SH groups of proteins to combine with arsenic when it is in the pentavalent state (ultrafiltration experiments)*

Solution in filter	Concentration of arsenic in ultrafiltrate (Gutzeit)
2.1 per cent solution of native crystalline egg albumin+m/1000 3-amino-4-hydroxyphenyl arsonic acid	0.076 mg. per c. c. 100 per cent.
2.1 per cent solution of coagulated egg albumin+m/1000 3-amino-4-hydroxyphenyl arsonic acid	0.076 mg. per c. c. 100 per cent.
5.4 gm. rat testes (dialyzed for 1 day)+m/1000 3-amino-4-hydroxyphenyl arsonic acid	100 per cent.

Similarly, experiments upon native tissue proteins that contained sulphydryl groups demonstrated that the pentavalent arsenic compound did not combine with them. Five and four-tenths grams of testes, from two rats, were minced with scissors and dialyzed in running tap water for 24 hours. After that time the trichloracetic acid extract of the testes showed only a trace of color with the nitroprusside reaction, while the (undenatured) dialyzed tissue gave a strongly positive reaction. The volume of the tissue was now made up to 22.5 c. c. and 2.5 c. c. of 0.01 molar 3-amino-4-hydroxyphenyl arsonic acid added. Determinations of arsenic (run in duplicate) by the Gutzeit method showed the same concentration in the protein-free ultrafiltrate as in the supernatant fluid. (Table 3.)

The lack of a reaction between the tissue proteins and pentavalent arsenic is particularly interesting since it is generally considered (Joachimoglu (12); Kuroda (13)) that tissues can reduce arsenic from the pentavalent to the trivalent form. It is evident that no such reduction takes place *within the time of these experiments*, and within a pH range close to neutrality; this is in agreement with the observations of Voegtlin, Rosenthal, and Johnson (4), who found that this

compound and other pentavalent arsenicals did not bring about a reduction of oxygen consumption of tissues, *in vivo*, during observations extending over two hours or longer.

CHEMICAL EVIDENCE OF AN ACTION OF ARSENIC UPON THE SULPHYDRYL GROUPS OF PROTEINS

In the course of the preceding experiments it was observed that when the trivalent arsenical was added to proteins containing a sulphydryl radical, the nitroprusside test became negative. Under the conditions of these experiments the nitroprusside test may be considered as specific for sulphydryl radicals (14). The disappearance of this reaction could mean either an oxidation of the SH groups or the formation of a compound no longer giving the test.

The following experiment, performed with the Warburg microrespiration apparatus, demonstrated that the disappearance of the nitroprusside test was not due to the oxidation of the SH groups. To 84 mg. of coagulated crystalline egg albumin (4.0 c. c.) at pH 7.5, in a respiration vessel, 0.5 c. c. of 0.01 molar arsenoxide was added from a side arm after readings had begun. No uptake of oxygen over a period of four hours was brought about by this addition.

It can be shown in another way that this action of arsenic upon the tissue sulphydryl groups is not an oxidation. If oxidation is brought about by other means, the addition of cyanide will reduce these groups and restore the nitroprusside test. When the nitroprusside test has been made to disappear by trivalent arsenic, cyanide has no effect in rendering the test positive. This demonstrates that the union between arsenic and sulphydryl is sufficiently firm so that it is not dissociated by cyanide.

The disappearance of the nitroprusside reaction also takes place when arsenoxide is added to crystalline SH glutathione or to cysteine. When increasing amounts of arsenoxide are added to these compounds, the nitroprusside test becomes proportionately diminished; and when approximately ten times the molar quantity of arsenoxide is added, the test becomes negative and is not restored by the addition of cyanide. [1]

Advantage was taken of these observations to study the combining power of the sulphydryl-containing proteins with arsenoxide, using the nitroprusside test as an indicator. The principle of this method is different from that of the ultrafiltration experiments in that it depends on the detection of reactive sulphydryl groups, whereas the preceding method was based upon estimations of uncombined arsenic. In its present state the nitroprusside method can not be used for the

[1] Further evidence of a chemical union between arsenic and the SH group of cysteine is afforded by the Sullivan test. Just as with the nitroprusside test, the Sullivan test for cysteine and cystine is rendered negative by approximately ten times the molar concentration of arsenoxide.

quantitative estimation of fixed sulphydryl groups in proteins, for the results on glutathione and cysteine show that an excess of arsenic is required beyond the theoretical requirements of such a reaction. The experiments are of interest, however, in showing that a quantitative relationship exists, and also in comparing the values obtained upon different proteins. The protein arsenic mixture is allowed to stand with equal parts of 5 per cent sodium cyanide for at least ten minutes before carrying out the nitroprusside tests. This permits the cyanide to reduce the existing S–S groups in the proteins to SH groups and thereby make them available for combination with the arsenic. The presence of cyanide does not interfere with the reaction between arsenic and SH, so that with this procedure consistent results can be obtained upon a given protein solution.

It was found with coagulated egg white that a definite linear ratio exists between the quantity of protein present and the amount of arsenic required to make the nitroprusside test negative. Thus, various amounts of egg white, from 12 to 54 mg. of protein, required quantities of arsenoxide that were in linear proportion. (Table 4.)

TABLE 4.—*The quantity of arsenoxide necessary to render the nitroprusside test negative upon heat denatured proteins (100° C. for 2 minutes), equal parts of 5 per cent cyanide added before preforming the test*

	m/400 arsenoxide	H_2O	Nitroprusside test	Amount of arsenoxide per gram of protein
Egg white (with equal parts of saline 6 per cent protein)				
0.2 c. c.	0.2 c. c.	0.2 c. c.	+	17.7 mg.
0.2 c. c.	0.3 c. c.	0.1 c. c.	neg.	
0.2 c. c.	0.4 c. c.	0	neg.	
0.3 c. c.	0.3 c. c.	0.2 c. c.	+	
0.3 c. c.	0.4 c. c.	0.1 c. c.	±	17.7 mg.
0.3 c. c.	0.5 c. c.	0	neg.	
0.6 c. c.	0.7 c. c.	0.2 c. c.	+	
0.6 c. c.	0.8 c. c.	0.1 c. c.	+	17.7 mg.
0.6 c. c.	0.9 c. c.	0	neg.	
0.9 c. c.	1.1 c. c.	0.4 c. c.	+	
0.9 c. c.	1.3 c. c.	0.2 c. c.	±	17.7 mg.
0.9 c. c.	1.5 c. c.	0	neg.	
Rabbit serum (with equal parts of saline)				
0.5 c. c.	0.2 c. c.	0.2 c. c.	+	
0.5 c. c.	0.3 c. c.	0.1 c. c.	neg.	11.15 mg.
0.5 c. c.	0.4 c. c.	0	neg.	
0.71 per cent solution of crystalline egg albumin				
2.0 c. c.	0.05 c. c.	0.25 c. c.	+	
2.0 c. c.	0.2 c. c.	0.1 c. c.	+	12.7 mg.
2.0 c. c.	0.25 c. c.	0.05 c. c.	±	
2.0 c. c.	0.3 c. c.	0	neg.	
0.70 per cent solution of ovoglobulin	0.2 c. c.	0.15 c. c.	+	
	0.25 c. c.	0.1 c. c.	+	
	0.3 c. c.	0.05 c. c.	±	15.22 mg.
	0.35 c. c.	0	neg.	

We have shown that serum, after rapid heat coagulation, gives a faint nitroprusside reaction which rapidly becomes negative. The addition of cyanide to serum makes the nitroprusside test strongly positive, an observation also made by Walker (15). It is therefore possible by the above technique to titrate the disulphide groups in coagulated serum. With rabbit serum a titer with arsenoxide was obtained that was only slightly lower than that of the other proteins studied. It will be recalled in this connection that in the ultrafiltration experiments where no cyanide was employed, the serum combined with very little arsenic.

By this method egg albumin required an equivalent of 12.72 mg. of arsenoxide per gram of protein to render the nitroprusside test negative. This is in close agreement with the results of the ultrafiltration experiments where albumin, with no cyanide present, combined with 11.81 mg. of arsenoxide per gram of protein. This would indicate that heat coagulation of egg albumin brings out practically all of the available SH groups; and in support of this it was found that if nitroprusside tests were performed soon after coagulation, the absence of cyanide made no appreciable difference in the arsenoxide titer.

In the ultrafiltration experiments it was found that globulin combined with much less arsenoxide than did albumin, and this was shown to be associated with the rapid oxidation of the SH groups of coagulated globulin. When the available sulphydryl groups of coagulated ovoglobulin were reduced with cyanide, it was found that ovoglobulin required slightly more arsenoxide to render the nitroprusside test negative than did ovoalbumin; this is evidence of more S–S or SH groups in globulin than in albumin. (Table 4.)

Decrease in reducing power of fixed SH groups produced by arsenic.—We were able by another chemical method to demonstrate a combination between trivalent arsenic and SH groups. This is illustrated by the following experiments: Into a series of Thunberg tubes were placed 5 c. c. of fresh egg white (diluted 1 to 3 with saline). To four of the tubes was added methylene blue to make a final concentration of m/15000, and into the remainder indigo carmine to make a m/12000 solution. Varying amounts of neutralized arsenious oxide were added; the tubes were evacuated by means of a high vacuum pump and then immersed in water at 85° C. for five minutes, to coagulate the egg white. The time required to reduce the indicators was as follows:

Methylene blue

Egg white	½ minute.
Egg white + m/170 As_2O_3	3 hours.
Egg white + m/500 As_2O_3	2 minutes.
Egg white + m/1000 As_2O_3	1 minute.

Indigo carmine	Per cent reduction in— 5 min.	2 hours
Egg white	100	----
Egg white+m/250 As_2O_3	50	50
Egg white+m/10000 As_2O_3	90–100	100

Native egg white plus arsenious oxide was without effect under these conditions.

Pentavalent arsenic.—In agreement with the ultrafiltration experiments, it was found that the addition of 3-amino-4-hydroxyphenyl arsonic acid or of arsenic pentoxide to coagulated egg albumin did not bring about a disappearance of the nitroprusside test, even when large amounts of these arsenicals were added. Only the trivalent arsenic can combine with the sulphydryl groups.

BIOLOGICAL EXPERIMENTS DEMONSTRATING A COMBINATION BETWEEN TRIVALENT ARSENIC AND FIXED SULPHYDRYL GROUPS

The method which we have employed for this purpose was to study the influence of proteins, with and without sulphydryl groups, on the toxic action of arsenic upon trypanosomes *in vitro*. This is an adaptation of the procedure used by Voegtlin, Dyer, and Leonard (1) to show the antagonism between glutathione and arsenic. Varying concentrations of arsenoxide were added to the protein solution in small-sized test tubes. After thorough mixing, the blood from a rat heavily infected with *Trypanosoma equiperdum* was introduced. At short intervals a drop of the mixture was removed with a glass rod and examined under the microscope as to the condition of the trypanosomes.

Egg white was first studied in this manner. The native egg white makes an excellent control, for it contains various proteins (without detectable SH groups) as well as carbohydrates and fats with which arsenoxide might combine. Just as in the ultrafiltration experiments no evidence of such a combination occurred. The arsenoxide was just as toxic for trypanosomes when suspended in uncoagulated egg white as it was in 0.8 per cent saline solution. (Table 5.) A concentration of m/100000 arsenoxide caused complete cessation of motility of the trypanosomes in ten minutes.

TABLE 5.—*The prevention of the toxic action of arsenoxide on trypanosomes (in vitro) by coagulated egg white*

Final concentration of arsenoxide	Egg white uncoagulated	Effect on trypanosomes								
		5 min.	10 min.	20 min.	30 min.	45 min.	60 min.	90 min.	120 min.	1,140 min.
m/1,000	0.75 c. c.	Im.	Im.	Im.	Im.	Cytol.	------	------	------	------
m/5,000	0.75 c. c.	Im.	Im.	Im.	Im.	Cytol.	------	------	------	------
m/10,000	0.75 c. c.	Slug.	Im.	Im.	Im.	Im.	Cytol.	------	------	------
m/100,000	0.75 c. c.	Slug.	Im.	Im.	Im.	Im.	Im.	Cytol.	------	------
0	0.75 c. c.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.
0	0 (0.8% NaCl.)	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Cytol.
	Egg white coagulated									
m/1,000	0.75 c. c.	Mo.	Mo.	Im.	Im.	Im.	Im.	Cytol.	Cytol.	Cytol.
m/5,000	0.75 c. c.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Im.
m/10,000	0.75 c. c.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Im.
m/100,000	0.75 c. c.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.
0	0.75 c. c.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.
0	0 (0.8% NaCl.)	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Cytol.

Mo. = motile; Slug. = sluggish; Im. = immotile; Cytol. = cytolysis.

Coagulation of the egg white made a striking difference. Concentrations of arsenoxide as high as m/5,000 were practically devoid of toxic action when a similar quantity of coagulated egg white was present. Even after 19 hours (at room temperature) the organisms were still motile in the mixture containing m/100,000 arsenoxide and in the egg white solutions alone. At this time motility had ceased in the presence of higher concentrations of arsenic, and in the 0.8 per cent salt solution control.

This same protective action was manifested by coagulated recrystallized egg albumin (previously dialyzed two days to remove the ammonium sulphate). Arsenoxide, in concentrations as high as m/5,000, during the length of the experiment showed no toxic action in the presence of 2.1 per cent coagulated albumin, while a concentration of m/100,000 caused cessation of motility within ten minutes when the protein was present in its native state. (Table 6.)

TABLE 6.—*The prevention of the toxic action of arsenoxide on trypanosomes (in vitro) by coagulated crystalline egg albumin*

Final concentration of arsenoxide	2.1% egg albumin solution uncoagulated	Effect on trypanosomes								
		5 min.	10 min.	20 min.	30 min.	45 min.	60 min.	90 min.	120 min.	150 min.
m/1,000	2.7 c. c.	Im.	Im.	Im.	Cytol.	Cytol.	Cytol.	Cytol.	Cytol.	Cytol.
m/5,000	2.7 c. c.	Im.	Im.	Im.	Im.	Im.	Cytol.	Cytol.	Cytol.	Cytol.
m/10,000	2.7 c. c.	Im.	Im.	Im.	Im.	Im.	Cytol.	Cytol.	Cytol.	Cytol.
m/100,000	2.7 c. c.	Mo.	Im.	Im.	Im.	Im.	Im.	Im.	Im.	Im.
m/100,000	0 (0.8% NaCl)	Mo.	Im.	Im.	Im.	Im.	Im.	Im.	Im.	Im.
0	2.7 c. c.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.
	2.1% egg albumin solution coagulated									
m/1,000	2.7 c. c.	Im.	Im.	Im.	Im.	Im.	Cytol.	Cytol.	Cytol.	Cytol.
m/5,000	2.7 c. c.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.
m/10,000	2.7 c. c.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.
m/100,000	2.7 c. c.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.
0	2.7 c. c.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.
0	0 (0.8% NaCl)	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.	Mo.

Mo. = motile; Im. = immotile; Cytol. = cytolysis.

COMPARISON OF RESULTS WITH THE THREE METHODS

A comparison of the results obtained upon the same protein solution with the ultrafiltration, nitroprusside, and trypanosome procedures was made, to see what relationship the values obtained bore to each other.

For this purpose a sample of recrystallized egg albumin (dialyzed one day) was employed. It contained 1.67 per cent protein and the pH of the solution was 7.4. An ultrafiltration experiment carried out in the usual manner upon this coagulated egg albumin solution revealed that by this method the albumin combined with the equivalent of 14.17 mg. of arsenoxide per gram of protein. (Table 7.) This is in fair agreement with the value of 11.81 mg. obtained with the 2.1 per cent albumin solution in the earlier experiment.

The value for the amount of arsenoxide necessary to render the nitroprusside test negative upon this solution was an equivalent of 11.81 mg. of arsenoxide per gram of protein. In these experiments the tests were done soon after the coagulation of the protein and the same value was obtained in the absence of cyanide as in its presence, so that the results are comparable to those with ultrafiltration. In the previous studies with the nitroprusside test (Table 4) upon the 0.71 per cent albumin solution, a value of 12.7 mg. of arsenoxide per gram of protein was obtained.

In the trypanosome experiments a preliminary test was done to establish the approximate amount of arsenoxide inactivated by a given quantity of coagulated albumin. A series of tubes was then set up, as shown in Table 7, in which the concentrations of arsenoxide were varied within this range. A fairly sharp end point was obtained, considering that the trypanosomes are affected by extremely small amounts of arsenoxide. For the purpose of calculating the combining power of the protein with arsenic, the concentration that caused cessation of motility of the organisms in 10 minutes was taken as an end point. This represents a concentration of active arsenoxide of approximately m/100,000 which is within the range of experimental error of the methods with which a comparison is being made. On this basis, the trypanosome experiments indicate that 1 gram of coagulated albumin can inactivate 7.87 mg. of arsenoxide.

TABLE 7.—*A comparison of the ability of a solution of coagulated crystalline egg albumin to combine with arsenoxide, as determined by the three different methods*

1.67% solution crystalline egg albumin (pH 7.4)	Arsenoxide	Ultrafiltration experiments	Amount arsenoxide combined with 1 g. albumin
22.5 c. c.	2.5 c. c. m/100	18.2% of arsenoxide in ultrafiltrate	14.17 mg.
		Nitroprusside tests	
1.0 c. c.	0.1 c. c. m/400	++	
1.0 c. c.	0.15	+	
1.0 c. c.	0.2	+	
1.0 c. c.	0.25	+	
1.0 c. c.	0.3	neg.	11.81 mg.
		Time required to stop motility of trypanosomes	
2.5 c. c.	0.55 c. c. m/400	< 5 min.	
2.5 c. c.	0.5	10 min.	
2.5 c. c.	0.45	30 min.	
2.5 c. c.	0.4	40 min.	7.87 mg.
2.5 c. c.	0.35	120 min.	
2.5 c. c.	0.3	Some motility present in 120 min.	
2.5 c. c.	0.2	Motility present in 120 min.	

These results show a good agreement between individual experiments with the ultrafiltration and nitroprusside methods, and also that upon a given protein these two methods yield results that are quite close to each other. This is added proof that physical adsorption of arsenoxide by protein does not play a part in the ultrafiltration experiments. The tests upon trypanosomes yield a result somewhat lower than that with the other procedures. One factor that could contribute to this discrepancy is that the test object used to demonstrate the absence of free arsenoxides, i. e., the trypanosomes, themselves contain sulphydryl groups (Voegtlin, Dyer, and Leonard (1)) and can therefore compete with the SH groups of the protein for the arsenic.

DISCUSSION

The above described experiments demonstrate that trivalent arsenic (arsenoxide) combines chemically with those proteins that contain fixed sulphydryl groups in their molecule, and that no such combination occurs in the absence of SH groups. This constitutes good evidence of the specificity of such a reaction, and it is further supported by the demonstration that pentavalent arsenic is unable under the conditions of these experiments to enter into this combination.

These results lend support to the view that the action of trivalent arsenic upon living tissues is primarily upon the sulphydryl compounds. It is particularly satisfying to such a view that arsenoxide is just as toxic for trypanosomes in native egg white, containing a wide variety of chemical substances, as it is in salt solution, while

coagulated egg white, containing SH groups, greatly decreases the toxicity of this arsenical.

A discussion of the mechanism of arsenic action, with particular reference to the SH compounds of living cells, has been recently presented by Rosenthal and Voegtlin (3). The present evidence substantiates these views and suggests the physiological rôle of the fixed sulphydryl groups in tissue respiration, since a decrease in respiratory function is a characteristic effect of arsenious oxides. The relationship of fixed SH groups of extracted tissues to biological oxidations has been made the subject of investigation particularly by Meyerhof (16) and Hopkins (8). Our experiments showing that the action of arsenic brings about a decrease in the reducing power of SH groups is of particular interest in this connection. Levaditi and his associates (17) have shown that atoxyl, *in vitro*, becomes trypanocidal when incubated at 37° C. with minute amounts of glutathione or with tissue proteins. Their explanation concerning glutathione is that more trivalent arsenic is formed from atoxyl than can be completely neutralized by the sulphydryl compounds present, but they did not establish the rôle of the fixed SH groups of proteins in such a mechanism.

A discussion of the relative importance of glutathione and of the fixed sulphydryl groups of proteins in the mechanism of action of arsenic upon the tissues would be premature at this point.

The titration of the fixed SH groups of proteins with arsenoxide, employing the disappearance of the nitroprusside test as an end point, affords a simple way to study these compounds, and, providing that the quantitative relationships of the procedure can be established, it should prove of value as a method for the quantitative estimation of such sulphydryl compounds. By omitting cyanide from the procedure, repeated determinations upon a protein solution can be employed to indicate the relative rates of oxidation of SH groups.

SUMMARY

1. Arsenoxide, a trivalent arsenical (3-amino-4-hydroxyphenyl arsenious oxide), was added to native egg white, crystalline egg albumin, ovoglobulin, blood serum, and casein (containing no SH groups) and the solutions were ultrafiltered through collodion membranes. No evidence of a combination between arsenic and protein occurred, the arsenic appearing in the ultrafiltrate in approximately the original concentration.

2. When these proteins were coagulated to bring out the SH groups, ultrafiltration experiments revealed a marked ability to combine with arsenoxide and the degree of combination was proportionate to the sulphydryl groups present (as evidenced by the strength of the nitroprusside test).

3. Fresh rat testes and liver when washed free from glutathione were shown to contain fixed SH groups, and these preparations, as well as a thermostable muscle residue, were shown by ultrafiltration experiments to be able to combine with arsenoxide.

4. Ultrafiltration experiments upon a similar arsenic compound containing arsenic in the pentavalent state (3-amino-4-hydroxyphenyl arsonic acid) showed that coagulated proteins and glutathione-free tissues, containing fixed SH groups, did not combine with pentavalent arsenic.

5. Arsenoxide when added to sulphydryl-containing proteins combines with the SH groups in such a way that they no longer give the nitroprusside test. This union is sufficiently firm as to be unaffected by the addition of cyanide. The arsenoxide titers, using the disappearance of the nitroprusside test as an end point, were determined upon various proteins, and upon SH glutathione and cysteine.

6. Pentavalent arsenic can be shown by this method also to be unable to combine with fixed SH groups, for it does not bring about the disappearance of the nitroprusside test.

7. It can be shown by a biological method that trivalent arsenic does not combine with native proteins containing no SH groups, for arsenoxide is just as toxic for trypanosomes in the presence of native egg white or crystalline egg albumin as it is in 0.8 per cent salt solution.

8. When egg white or crystalline egg albumin are coagulated to bring out their SH groups, a combination with arsenoxide occurs and complete protection of trypanosomes against arsenic action can be effected by the presence of these coagulated proteins.

9. The presence of arsenious oxide interferes with the reduction of methylene blue and indigo carmine, under anaerobic conditions, by coagulated egg white.

ACKNOWLEDGMENTS

The author wishes to express his appreciation to Professor Carl Voegtlin for helpful suggestions and criticism.

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THE CHLORINATION OF BALLAST WATER ON GREAT LAKES VESSELS

By G. H. Ferguson, *Chief Sanitary Engineer, Department of Pensions and National Health of Canada*

In the final report of the International Joint Commission on the Pollution of Boundary Waters issued in 1918, it was recognized that in addition to contamination of Great Lakes waters by vessel sewage there was also a possibility of polluting harbor waters, particularly near municipal intakes, by the unrestricted discharge of vessel ballast water, which is usually seriously contaminated. After a discussion of pollution by vessel sewage, the report continues as follows:

> Pollution by water ballast constitutes a more difficult problem. There has not yet come to the notice of the commission any feasible means of purifying the rather large quantities of water which vessels while in the polluted areas of inner harbors frequently take on board for purposes of ballast, and which they afterwards discharge upon approaching their destination, often while passing water intakes. It will probably be sufficient for the present at least to control this practice by regulations designed to limit or prevent the discharge of ballast water in the neighborhood of intakes. In the event of failure of such control by regulations, more expensive and time-consuming methods of treatment will have to be developed and prescribed.

With a view to investigating the feasibility of such methods as were suggested for chlorinating ballast water, and also to consider other relevant matters, a brief study of this question was made in the latter part of the navigation season of 1930.

The data collected are presented in the accompanying table:

Data regarding ballast water and ballast tanks on certain Great Lakes vessels

Vessel	Total ballast capacity	Time to discharge	Remarks
	Tons	*Hours*	
Huronic			Ballast tanks filled at Sarnia and discharged there on return from Windsor. Ballast water also taken at Fort William prior to trip to Duluth.
Shelton Weed	810	5	
Rahane	730	6	
Ralph Budd	2,000	6	
Algonquins	1,000	5	
Noronic			Ballast tanks filled at Point Edward going westward and emptied at Point Edward on return trip eastward.
Ontadoc	2,000	6	
Penetang	975	4	
Coalhaven	1,250	5	
Lachindoc	760	5	
Hamonic			Ballast tanks filled or emptied at any point that is required and emptied as cargo becomes heavier.
Donnacona	7,852	2	
Royalite	1,000	3	
Aycliffe Hall			Ballast tanks unlined.
Lemoyne	7,000		Ballast tanks unlined and never cleaned.
Soreldoc			Ballast tanks unlined and never cleaned. Variable ballast carried.
Elgin			Ballast tanks never cleaned.
City of Windsor			Ballast water taken from Toronto Harbor and discharged at or near Montreal.
Cement Karrier			Ballast tanks unlined.
City of Toronto			Ballast water obtained in Lake Ontario.
Ashcroft			Ballast tanks not cleaned and unlined.
Maplebay		6	Ballast water obtained in Montreal Harbor and canals is discharged in harbor at Fort William.

While the small number of vessels examined does not warrant the drawing of very specific conclusions, there are, nevertheless, a number of observations to be made. The ballast tank capacity of canal-sized freighters and upper lake vessels ranges from 750 to 7,500 tons, which may be discharged in periods from 2 to 6 hours. In a typical steamship the ballast water is stored in the forepeak, two or three tanks under the cargo hold and engine room, and in the afterpeak. Additional ballast capacity is sometimes obtained by flood valves opening from the tanks into the cargo hold. Each tank is separated not only by a bulkhead but also by a partition running parallel with and over the keel. The pumping arrangement is usually a simple one, suction pipes from each tank leading to a common manifold in the engine room and thence to the pump or pumps.

There are several methods of chlorinating ballast water which might be adopted, using sodium hypochlorite as the medium for transporting the chlorine. One proposal was to add a 2 per cent solution of sodium hypochlorite by means of a chlorinator to the ballast water as it was discharged from the tanks through the chlorinating chamber (pipes or tank) to overboard. As the detention period available would seriously limit the time for the chlorine to complete its action, a high concentration of solution would be necessary and this might lead to possible corrosion of ship plate if a ship tank were used for the retention chamber. For this reason a separate tank

would have to be built in the engine room or at some other convenient place. This plan, while it has the merit of being an effective one, might be prohibitive because of the cost entailed.

To lessen this disadvantage and to render effective the long detention period afforded by vessels in plying from port to port, a second proposal was to chlorinate the water on admission to the ballast tanks. This might be done in two ways. A solution chlorinator installed near the ballast water pumps would add a definite amount of chlorine to the water as it was pumped to the tanks, or, dispensing with additional apparatus altogether, proper amounts of the solution could be added to the empty tanks by means of the sounding pipes. Then when the pumps were started, the inrush of fresh ballast water would cause the solution to be thoroughly mixed with the water. This method has the advantage of not only being economical but the thoroughness of the disinfection may be checked by taking ballast water samples from a vessel intercepted at any canal en route from port to port and sailing light. A serious objection is the corrosiveness of chlorine with its damaging effect on steel plate. As the concentration of free chlorine for 100 per cent sterilization of all bacteria would vary with the bacterial counts of different harbor waters, the chlorine dosage for a given case might be far in excess of the amount required, leaving some free chlorine to attack the steel. This might be obviated to a certain extent by dividing the harbor waters into classifications on the basis of plate counts of total bacteria and specifying a chlorine dosage for each class. Thus a ship leaving Montreal Harbor with ballast water would use a certain concentration of free chlorine which would be just sufficient or nearly so for the purpose, while another ship taking ballast in one of the upper lake canals would probably use a lesser amount.

In general, there do not seem to be any real physical difficulties in the way of effectively chlorinating ballast water. It has been shown that ballast water tanks are usually filthy, containing accumulations of rust and other sediment; and when to these tanks is added foul harbor water it is at once apparent that pollution of otherwise uncontaminated water, particularly near municipal intakes, is quite within the realm of possibility.

Further study was discontinued on this problem as it was felt that sufficient data had been gathered for present purposes and that direct pollution of Great Lakes waters by vessel sewage is a far more serious menace and one which should receive first attention, rather than the lesser menace of vessel ballast water.

DEATH RATES IN A GROUP OF INSURED PERSONS

Rates for Principal Causes of Death for November, 1931

The accompanying table, taken from the Statistical Bulletin for December, 1931, issued by the Metropolitan Life Insurance Co., presents the mortality record of the industrial insurance department of the company for November as compared with that for the preceding month and for the corresponding month of last year. It also gives the cumulative rates for the period January–November for the years 1930 and 1931. The rates are based on a strength of approximately 19,000,000 insured persons in the United States and Canada. In recent years the general death rate in this more or less selected group of persons has averaged about 72 per cent of the rate for the registration area of the United States.

The Bulletin states:

In no previous November have health conditions among Metropolitan industrial policyholders been as favorable as during that month in 1931. The death rate was 7.7 per 1,000, as compared with the previous minimum of 7.8 in November, 1930. In only one other November (in 1924) has the death rate among insured wage earners fallen below 8 per 1,000.

The cumulative death rate for the 11 elapsed months of 1931 is only two-tenths of 1 per cent above the minimum—recorded in 1930. Furthermore, in December, 1931, lower mortality rates than those of December, 1930, prevailed up to the middle of the month. It is thus entirely possible that this slightly adverse margin will be wiped out by the end of the year. Mortality data for the general population of certain large cities show, up to the end of the forty-seventh week, a cumulative death rate of only 11.8 per 1,000, as compared with 11.9 for the corresponding period of 1930, thus indicating that the excellent health conditions prevailing among insured wage earners in 1931 have also obtained for the population in general. Among the insured who live in the Pacific Coast and Mountain States, and among those in Canada, markedly lower November death rates were registered than ever before, and the cumulative mortality for each of these large regions, up to the end of November, was well below the previous minimum.

With respect to four diseases, the facts are so clear cut that it is possible to announce, even before the close of the year, that the lowest mortality rates recorded to date will be registered this year. These are diphtheria, tuberculosis, diarrheal complaints, and puerperal conditions. There is also every prospect that a new minimum will be shown for typhoid fever, and there is an excellent chance that the mortality from chronic nephritis will be lower than ever before.

The reduction in the diphtheria death rate up to the end of November amounted to 28 per cent. The mortality from this disease has been reduced more than one-half in the brief period of 2 years; more than two-thirds in 7 years; and the death rate is now less than one-sixth the figure recorded 20 years ago. With the single exception of typhoid fever, diphtheria has recorded a greater per cent reduction in its death rate since 1911 than has any other cause of death. The mortality for measles and scarlet fever is running a little higher than in 1930, but the death rate for each is well below the average for the past 10 years; and in the case of each the rate represents only a small fraction of the figure registered 20 years ago. The whooping-cough mortality rate is about at the average for the past decade.

A very unusual development this year is an actual reduction in the pneumonia death rate in the face of a marked rise in that for influenza. Even during the influenza outbreak of last winter the pneumonia mortality did not increase to the extent usually observed during former periods of widespread prevalence of influenza; and after the epidemic had run its course, every month recorded a lower pneumonia death rate than did the corresponding month of 1930.

On the other side of the picture no doubt remains that new maximum death rates will be registered in 1931 for cancer, diabetes, and automobile fatalities, and the heart disease mortality rate will probably be higher than ever before.

Death rates (annual basis) per 100,000 for principal causes of death

[Industrial department, Metropolitan Life Insurance Co.]

Cause of death	Annual rate per 100,000 lives exposed [1]				
	November, 1931	October, 1931	November, 1930	Cumulative, January to November	
				1931	1930
Total, all causes	771.6	780.2	775.2	876.3	874.8
Typhoid fever	2.2	4.9	2.7	2.2	2.3
Measles	.6	.5	.2	3.2	3.0
Scarlet fever	2.0	1.9	2.1	3.1	2.5
Whooping cough	2.9	3.3	2.3	3.6	4.4
Diphtheria	7.6	4.0	5.8	4.2	5.8
Influenza	8.1	5.2	10.9	21.1	14.5
Tuberculosis (all forms)	66.9	70.9	65.8	76.1	81.6
Tuberculosis of respiratory system	59.3	63.0	58.0	67.2	71.1
Cancer	83.6	79.7	72.2	82.4	77.7
Diabetes mellitus	20.5	18.4	16.3	20.6	18.4
Cerebral hemorrhage	54.6	55.7	56.1	60.6	60.1
Organic diseases of heart	131.0	125.8	131.8	147.1	144.3
Pneumonia (all forms)	56.3	41.3	67.4	74.7	75.9
Other respiratory diseases	8.3	8.4	9.4	10.3	11.1
Diarrhea and enteritis	12.2	27.0	19.2	16.1	21.1
Bright's disease (chronic nephritis)	65.2	58.4	61.4	66.2	67.7
Puerperal state	8.8	10.0	8.7	11.0	12.1
Suicides	8.0	10.0	9.7	9.7	9.7
Homicides	5.6	8.3	5.9	6.9	6.6
Other external causes (excluding suicides and homicides)	56.1	57.0	54.2	60.7	62.5
Traumatism by automobiles	23.0	25.4	21.3	21.7	20.5
All other causes	171.0	189.4	173.2	196.4	193.7

[1] All figures in this table include insured infants under 1 year of age. The rates for 1931 are subject to slight correction, since they are based on provisional estimates of lives exposed to risk.

COURT DECISION RELATING TO PUBLIC HEALTH

Portion of narcotic act authorizing forfeiture of vehicle without notice to owner held invalid.—(California District Court of Appeal, First District; People *v.* Broad (General Motors Acceptance Corporation, Intervener), 5 P. (2d) 55; decided Nov. 7, 1931.) A contract was entered into for the purchase by the defendant of an automobile and a part of the purchase price was paid. Under the contract, title was retained by the seller; but on the date of the execution of the contract, the interest of the seller therein, with title to the automobile, was transferred to the intervening corporation. The defendant subsequently pleaded guilty to a charge of violating the State narcotic act, and, in an action to forfeit the automobile because used in transporting narcotics, the lower court ordered it to be delivered to the State

department of finance. Section 15 of the narcotic law provided as follows:

> Any automobile or other vehicle used to convey, carry, or transport any of the drugs mentioned in section 1 of this act, which are not lawfully possessed or transported, is hereby declared to be forfeited to the State and may be seized by any duly authorized peace officer, and when such seizure is made shall be considered as part of the evidence under this act, and the magistrate shall, upon conviction of the party charged with the violation of said act, turn the automobile or other vehicle over to the department of finance of the State of California, and said department of finance shall deliver to the division of narcotic enforcement of the State of California such number of said automobiles or other vehicles as may be needed by the said narcotic division in enforcing the provisions of this act: *Provided*, That nothing contained herein shall apply to common carriers or to an employee acting within the scope of his employment under this act.

On appeal by the intervener, the district court of appeal held that the portion of the act which purported to authorize a forfeiture without notice to the owner was invalid, as being a denial of due process.

PUBLIC HEALTH SERVICE PUBLICATIONS

A List of Publications Issued During the Period July–December, 1931

There is printed herewith a list of publications of the United States Public Health Service issued during the period July–December, 1931.

The most important articles that appear each week in the PUBLIC HEALTH REPORTS are reprinted in pamphlet form, making possible a wider and more economical distribution of information that is of especial value and interest to public-health workers and the general public.

All of the publications listed below except those marked with an asterisk (*) are available for free distribution and as long as the supply lasts may be obtained by addressing the Surgeon General, United States Public Health Service, Washington, D. C. Those publications marked with an asterisk are not available for free distribution but may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., *at the prices noted.* (No remittances should be sent to the Public Health Service.)

Periodicals

Public Health Reports (weekly), July–December, vol. 46, Nos. 27–52, pages 1613 to 3155.

Venereal Disease Information (monthly), July–December. Vol. XII, Nos. 7–12, pages 287 to 581. (Index to vol. XII included in December issue.)

Reprints from the Public Health Reports

1489. Three outbreaks of food poisoning apparently due to B. enteritidis, B. paratyphosus B (aertrycke type), and B. paratyphosus A, respectively. By J. C. Geiger, Margaret Nelson, J. P. Gray, F. Firestone, and H. L. Wynns. July 3, 1931. 8 pages.

1490. Some essential considerations in connection with the rural health program. By W. F. Draper. July 10, 1931. 6 pages.

1491. Public Health Service Publications. A list of publications issued during the period January–June, 1931. July 10, 1931. 4 pages.

1492. The physical examination as an instrument of research. By Rollo H. Britten. July 17, 1931. 6 pages.

1493. A new subspecies, radicans, of Alcaligenes faecalis. By Alice C. Evans. July 17, 1931. 4 pages.

1494. The need for continued study in public-health work. By W. S. Leathers. July 24, 1931. 11 pages.

1495. The chemistry of cell division. II. The relation between cell growth and division in amoeba proteus. By H. W. Chalkley. July 24, 1931. 19 pages.

1496. Sickness among male industrial employees in the first quarter of 1931. By Dean K. Brundage. July 31, 1931. 2 pages.

1497. A study of illness among grade school children. By Charles C. Wilson, Ira V. Hiscock, J. H. Watkins, and Jarvis D. Case, with the cooperation of John L. Rice. July 31, 1931. 23 pages.

1498. Typhus fever. The rat flea, Xenopsylla cheopis in experimental transmission. By R. E. Dyer, E. T. Ceder, A. Rumreich, and L. F. Badger. August 7, 1931. 2 pages.

1499. Coordination in the sanitary control of bottled mineral waters. By W. S. Frisbie. August 7, 1931. 3 pages.

1500. Age and sex incidence of influenza and pneumonia morbidity and mortality in the epidemic of 1928–29 with comparative data for the epidemic of 1918–19. (Based on surveys of families in certain localities in the United States following the epidemics.) By Selwyn D. Collins. August 14, 1931. 29 pages.

1501. Dermatitis venenata due to contact with Brazilian walnut wood. By Louis Schwartz. August 14, 1931. 5 pages.

1502. Public health service in Knox county, Tennessee. Fiscal year July 1, 1929–June 30, 1930. By Joseph W. Mountin. August 21, 1931. 18 pages.

1503. A technique for adjustment of pH of hanging drop tissue cultures. By W. R. Earle. August 21, 1931. 11 pages.

1504. The medical profession and the health department. By A. J. McLaughlin. August 28, 1931. 7 pages.

1505. Expansion of investigations on tick-borne diseases by the United States Public Health Service. By R. R. Spencer. September 4, 1931. 5 pages.

1506. A survey of the work of employees' mutual benefit associations. By Dean K. Brundage. September 4, 1931. 18 pages.

1507. Cooperative campaign for the eradication of plague in Peru. Final report. By John D. Long. September 11, 1931. 8 pages.

1508. Occurrence of a colony of the tick parasite Hunterellus hookeri Howard in west Africa. By Cornelius B. Philip. September 11, 1931. 5 pages.

1509. Extent of rural health service in the United States 1927–1931. September 11, 1931. 14 pages.

1510. A note on the history of pellagra in the United States. By G. A. Wheeler. September 18, 1931. 7 pages.
1511. Sleeping car parking and sanitation at a large convention. By G. H. Ferguson. September 18, 1931. 5 pages.
1512. The catalytic action of copper in the oxidation of crystalline glutathione. By Carl Voegtlin, J. M. Johnson, and Sanford M. Rosenthal. September 18, 1931. 20 pages.
1513. Outbreak of undulant fever traced to infected milk supply. By H. E. Hasseltine and I. W. Knight. September 25, 1931. 10 pages.
1514. The functions and limitations of government in public health education. By Allan J. McLaughlin. September 25, 1931. 6 pages.
1515. Inspection of ships for determination of mosquito infestation. By W. F. Tanner. September 25, 1931. 15 pages.
1516. Present day problems of yellow fever. By Hugh S. Cumming. October 2, 1931. 6 pages.
1517. Experimental transmission of endemic typhus fever of the United States by the rat flea (Xenopsylla cheopis). By R. E. Dyer, E. T. Ceder, A. Rumreich, and L. F. Badger. October 9, 1931. 2 pages.
1518. Agglutinin absorption in undulant fever (Brucellosis). By Edward Francis. October 9, 1931. 21 pages.
1519. Double infection by organisms of the Brucella group. Report of a case. By Carl F. Jordan and I. H. Borts. October 9, 1931. 6 pages.
1520. Typhus fever. The experimental transmission of endemic typhus fever of the United States by the rat flea Xenopsylla cheopis. By R. E. Dyer, E. T. Ceder, R. D. Lillie, A. Rumreich, and L. F. Badger. October 16, 1931. 19 pages.
1521. Sickness among male industrial employees in the second quarter of 1931. By Dean K. Brundage. October 16, 1931. 3 pages.
1522. The effect of hemolytic streptococci and their products on leucocytes. By Alice C. Evans. October 23, 1931. 19 pages.
1523. Rat-flea survey of the port of St. Thomas, Virgin Islands. By E. H. Carnes. October 23, 1931. 5 pages.
1524. Dental decay and corrections among school children of different ages. Based on 12,435 oral examinations by dental personnel in Georgia, Illinois, Missouri, and Hagerstown, Md. (Studies in dental caries No. 1.) By Amanda L. Stoughton, and Verna Thornhill Meaker. October 30, 1931. 16 pages.
1525. The pellagra-preventive value of canned spinach, canned turnip greens, mature onions, and canned green beans. By G. A. Wheeler. November 6, 1931. 6 pages.
1526. A technique for adjustment of the pH of tissue cultures planted in Carrel flasks. By W. R. Earle. November 6, 1931. 3 pages.
1527. The movements of epidemic meningitis, 1915–1930. By A. W. Hedrich. November 13, 1931. 18 pages.
1528. Mosquitoes transported by airplanes. Staining method used in determining their importation. By T. H. D. Griffitts and J. J. Griffitts. November 20, 1931. 8 pages.
1529. Leprosy. A study of the white blood cells and their relation to clinical progress. By L. F. Badger. November 20, 1931. 20 pages.
1530. Pathology of the eastern type of Rocky Mountain spotted fever. By R. D. Lillie. November 27, 1931. 20 pages.
1531. State and insular health authorities, 1931. Directory, with data as to appropriations and publications. December 4, 1931. 23 pages.

1532. City health officers, 1931. Directory of those in cities of 10,000 or more population. December 4, 1931. 16 pages.

1533. The fumigation of vessels. A symposium. By C. L. Williams, B. E. Holsendorf, and J. R. Ridlon. July 3, July 10, July 17, July 24, July 31, August 14, August 28, and December 11, 1931. 81 pages.

1534. Microscopic examination for intestinal parasites of 73 boys in the National Training School for Boys, Washington, D. C. By C. E. Baker. December 11, 1931. 4 pages.

1535. Scarlet-fever streptococcus antitoxin in the treatment of scarlet fever. By M. V. Veldee, F. E. Stevenson, and A. Graeme Mitchell. December 18, 1931. 28 pages.

1536. Whole-time county health officers, 1931. December 18, 1931. 9 pages.

1537. Typhus fever: Typhus virus in feces of infected fleas (Xenopsylla cheopis) and duration of infectivity of fleas. By E. T. Ceder, R. E. Dyer, A. Rumreich, and L. F. Badger. December 25, 1931. 4 pages.

1538. Anopheles atropos D. & K.—A new potential carrier of malaria organisms. By Bruce Mayne and T. H. D. Griffitts. December 25, 1931. 9 pages.

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93. The rat proofing of vessels.—With drawings illustrating the general instructions for rat proofing of ships compiled and promulgated by the American Marine Standards committee (H No. 41, approved February 8, 1929). By S. B. Grubbs and B. E. Holsendorf. 1931. 84 pages.

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*101. Public health administration in Colorado. By C. E. Waller. 1931. 79 pages. 15 cents.

102. Some Public Health Service publications suitable for general distribution. 1931. 19 pages.

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200. The health of the school child. A study of sickness, physical defects, and mortality. By Selwyn D. Collins, with an introduction by Taliaferro Clark. August, 1931. 159 pages.

Reprints from Venereal Disease Information

31. Some public health aspects of syphilis. By Taliaferro Clark. From Venereal Disease Information, Vol. XII, No. 5. 17 pages.

32. Prevalence of venereal diseases in Charleston, W. Va. By Taliaferro Clark and Elizabeth V. Milovich. From Venereal Disease Information, Vol. XII, No. 6. 11 pages.

33. The Kahn reaction in the blood serum of normal and syphilitic guinea pigs. By. K. K. Bryant and J. F. Mahoney. From Venereal Disease Information, Vol. XII, No. 7. 4 pages.

34. A practical belt for mercury inunctions. By O. C. Wenger. From Venereal Disease Information, Vol. XII, No. 7. 2 pages.
35. The response of the Wassermann reaction to treatment in early syphilis as affected by the factors of race, sex, and pregnancy. By H. M. Robinson and Mildred H. Faupel. From Venereal Disease Information, Vol. XII, No. 8. 5 pages.
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*To a patient en route to the marine hospital, Fort Stanton, N. Mex. 3 pages. 5 cents.

*Index to Public Health Reports, vol. 46, Part I (January–June, 1931). xxx pages. 5 cents.

Annual Report

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ANNUAL MORTALITY SUMMARY FOR 83 LARGE CITIES, 1931

Number of deaths, death rates, and infant mortality in 83 large cities in 1931 (December 28, 1930, to January 2, 1932), and comparison with 1930

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

City	Total deaths [1]	Death rate [2] (per 1,000 estimated population)	Deaths under 1 year [1]	Provisional infant mortality rate 1931 [2 3]	Infant mortality rate 1930	Mortality data for calendar year, 1930 [4]		
						Total deaths	Death rate (per 1,000 estimated population)	Deaths under 1 year
Total (83 cities)	428,016	11.8	36,928	[5] 58	[5] 61	420,076	11.9	40,309
Akron	2,024	7.6	232	55	55	2,001	7.8	291
Albany	1,844	14.1	140	54	60	1,893	14.8	157
Atlanta [6]	4,206	14.9	438	80	94	4,205	15.5	496
White	2,162	11.5	226	63	65	2,099	11.6	228
Colored	2,044	21.6	212	114	148	2,106	23.2	268
Baltimore [6]	11,713	14.2	1,072	71	65	11,239	13.9	981
White	8,743	12.9	716	61	57	8,424	12.7	674
Colored	2,970	19.9	356	108	94	2,815	19.6	307
Birmingham [6]	3,566	13.0	322	63	78	3,548	13.6	404
White	1,696	10.0	161	50	55	1,623	10.0	168
Colored	1,870	17.9	161	82	111	1,925	19.3	236
Boston	11,221	14.1	1,058	60	70	11,018	14.1	1,263
Bridgeport	1,656	11.1	151	51	47	1,599	10.9	145
Buffalo	7,542	12.8	728	66	67	7,392	12.9	779
Cambridge	1,395	12.0	124	48	47	1,346	11.8	119
Camden	1,721	14.2	214	71	69	1,590	13.4	208
Canton	1,072	9.9	108	51	62	1,020	9.7	131
Chicago	36,656	10.4	3,036	56	54	35,316	10.4	3,112
Cincinnati	7,262	15.6	589	71	65	7,005	15.5	569
Cleveland	10,213	11.0	859	52	54	9,906	11.0	974
Columbus	4,025	13.4	276	52	71	4,470	15.3	380
Dallas [6]	3,060	11.0	372	(7)	(7)	3,012	11.5	393
White	2,231	9.7	283	(7)	(7)	2,153	9.9	258
Colored	829	17.2	89	(7)	(7)	859	19.0	135
Dayton	2,448	10.4	218	59	55	2,226	9.8	202
Denver	4,133	13.9	349	64	93	4,339	15.0	480

See footnotes at end of table.

Number of deaths, death rates, and infant mortality in 83 large cities in 1931 (December 28, 1930, to January 2, 1932), and comparison with 1930—Continued

City	Total deaths [1]	Death rate [2] (per 1,000 estimated population)	Deaths under 1 year [1]	Provisional infant mortality rate 1931 [2 3]	Infant mortality rate 1930	Mortality data for calendar year, 1930 [4]		
						Total deaths	Death rate (per 1,000 estimated population)	Deaths under 1 year
Des Moines	1,610	11.0	124	40	51	1,718	12.0	139
Detroit	13,627	8.1	1,621	55	65	14,729	9.3	2,134
Duluth	1,151	11.1	92	50	62	1,185	11.7	119
El Paso	1,592	14.9	300	(5)	(5)	1,822	17.7	353
Erie	1,253	10.5	103	41	50	1,308	11.2	125
Fall River [7]	1,298	11.1	131	65	66	1,323	11.5	146
Flint	1,130	6.8	175	48	68	1,399	8.9	284
Fort Worth [6]	1,780	10.5	151	(5)	(5)	1,806	11.0	188
White	1,443	10.1	128	(5)	(5)	1,378	10.0	131
Colored	337	12.2	23	(5)	(5)	428	16.2	57
Grand Rapids	1,575	9.0	131	42	48	1,697	10.0	165
Houston [6]	3,473	11.0	356	(5)	(5)	3,598	12.2	419
White	2,343	10.2	274	(5)	(5)	2,103	9.7	214
Colored	1,130	13.4	82	(5)	(5)	1,495	19.0	205
Indianapolis [6]	5,098	13.6	368	56	64	5,193	14.2	434
White	4,309	13.1	310	54	55	4,326	13.5	330
Colored	789	17.2	58	75	122	867	19.6	104
Jersey City	3,626	11.2	432	67	72	3,578	11.3	421
Kansas City, Kans. [6]	1,543	12.4	139	58	66	1,678	13.7	156
White	1,181	11.7	117	59	68	1,337	13.5	132
Colored	362	15.2	22	53	59	341	14.9	24
Kansas City, Mo	5,318	12.8	422	90	68	5,301	13.2	440
Knoxville [6]	1,376	12.4	167	79	81	1,500	14.1	195
White	1,080	11.6	145	76	80	1,180	13.2	170
Colored	296	16.4	22	112	93	320	18.5	25
Long Beach	1,528	9.9	55	27	41	1,490	10.4	85
Los Angeles	14,463	10.8	1,047	58	62	14,028	11.2	1,103
Louisville [6]	4,283	13.7	360	62	67	4,390	14.3	385
White	3,254	12.3	265	52	63	3,286	12.6	315
Colored	1,029	21.2	95	133	96	1,104	23.2	70
Lowell [7]	1,320	13.0	143	70	78	1,323	13.2	155
Lynn	991	9.5	69	37	55	1,057	10.3	100
Memphis [6]	4,298	16.3	472	97	102	4,398	17.3	500
White	2,162	13.3	241	77	81	2,124	13.5	251
Colored	2,136	21.2	231	131	139	2,274	23.5	249
Miami [6]	1,324	11.6	95	50	58	1,232	11.1	118
White	949	10.7	48	35	44	850	9.9	64
Colored	375	14.6	47	89	94	382	15.2	54
Milwaukee	5,423	9.0	618	55	58	5,568	9.6	674
Minneapolis	5,220	10.8	477	58	55	5,056	10.8	448
Nashville [6]	2,636	16.7	298	84	99	2,510	16.3	343
White	1,651	14.4	191	71	87	1,520	13.7	229
Colored	985	22.6	107	126	138	990	23.1	114
New Bedford [7]	1,372	12.0	160	87	54	1,242	11.0	108
New Haven	2,074	12.5	121	45	48	2,116	13.0	163
New Orleans [6]	7,843	16.5	716	77	88	8,030	17.4	821
White	4,556	13.5	368	60	71	4,741	14.4	441
Colored	3,287	24.0	348	107	120	3,289	25.0	380
New York	78,687	10.9	6,523	55	58	74,913	10.8	7,073
Bronx Borough	10,894	8.1	772	42	41	10,069	7.9	748
Brooklyn Borough	26,907	10.1	2,617	54	56	25,252	9.8	2,756
Manhattan Borough	30,357	16.4	2,381	64	71	29,680	16.0	2,767
Queens Borough	8,291	7.1	609	48	50	7,717	7.1	651
Richmond Borough	2,238	13.5	144	53	55	2,195	13.8	151
Newark, N. J	5,173	11.4	467	48	51	5,263	11.9	500
Oakland	3,241	10.9	179	42	47	3,178	11.1	194
Oklahoma City	2,126	10.6	260	67	83	2,105	11.2	309
Omaha	3,013	13.7	238	51	50	2,819	13.1	225
Paterson	1,855	13.1	162	55	51	1,669	12.0	157
Peoria	1,355	12.3	131	68	63	1,300	12.3	125
Philadelphia	25,657	12.8	2,210	64	64	24,516	12.5	2,287
Pittsburgh	9,702	14.1	1,033	89	69	9,312	13.9	1,032
Portland, Oreg	3,645	11.7	137	33	41	3,675	12.1	173
Providence	3,260	12.6	310	56	53	3,259	12.9	300
Richmond [6]	2,885	15.4	264	75	73	2,737	14.9	263
White	1,741	13.0	128	54	51	1,605	12.3	120
Colored	1,144	21.3	136	117	119	1,133	21.4	143

See footnotes at end of table.

Number of deaths, death rates, and infant mortality in 83 large cities in 1931 (December 29, 1930, to January 2, 1932), and comparison with 1930—Continued

City	Total deaths [1]	Death rate [2] (per 1,000 estimated population)	Deaths under 1 year [1]	Provisional infant mortality rate 1931 [2 3]	Infant mortality rate 1930	Mortality data for calendar year, 1930 [4]		
						Total deaths	Death rate (per 1,000 estimated population)	Deaths under 1 year
Rochester	3,943	11.7	291	52	51	3,786	11.5	289
St. Louis	12,327	14.6	787	53	54	11,482	13.9	787
St. Paul	2,902	10.3	168	34	43	2,879	10.6	218
Salt Lake City	1,733	11.9	139	41	54	1,822	12.9	187
San Antonio	3,429	14.1	569	(5)	(5)	3,733	16.0	603
San Diego	2,186	13.8	113	46	49	2,167	14.5	122
San Francisco	8,636	13.1	322	42	40	8,311	13.0	315
Schenectady	1,066	10.9	81	44	47	1,051	11.0	83
Seattle	4,293	11.4	168	31	38	4,007	10.9	199
Somerville	952	8.9	70	53	64	1,008	9.7	107
South Bend	879	8.0	80	44	49	954	9.1	99
Spokane	1,458	12.3	97	49	47	1,448	12.5	95
Springfield, Mass	1,772	11.4	144	46	53	1,771	11.8	164
Syracuse	2,484	11.5	241	58	56	2,461	11.7	240
Tacoma	1,365	12.5	90	47	45	1,370	12.8	84
Tampa [6]	1,252	11.7	119	64	58	1,178	11.6	106
White	904	10.7	69	45	43	836	10.4	64
Colored	348	15.4	50	149	127	342	15.9	42
Toledo	3,544	11.7	277	56	56	3,680	12.6	312
Trenton	2,042	16.2	160	60	78	1,893	15.3	224
Utica	1,489	14.3	71	38	68	1,510	14.8	127
Washington, D. C. [6]	7,925	15.9	685	72	71	7,387	15.1	664
White	4,897	13.5	323	50	52	4,595	13.0	327
Colored	3,028	22.1	362	121	110	2,792	20.9	337
Waterbury	966	9.4	108	67	62	1,060	10.6	129
Wilmington, Del. [7]	1,500	13.8	149	63	71	1,560	14.6	163
Worcester	2,414	12.0	173	46	63	2,498	12.8	228
Yonkers	1,169	8.3	106	51	48	1,132	8.4	103
Youngstown	1,709	9.7	177	54	58	1,782	10.5	218

[1] Based upon telegraphic reports received each week from city health officers.
[2] Allowance has been made for the 6 extra days, which must be deducted from the 53 weeks to give a period of 365 days.
[3] Infant mortality rate is based upon deaths under 1 year as returned each week and estimated births, 1931.
[4] Based upon deaths which occurred within the calendar year.
[5] Infant mortality rate for the cities in the birth registration area appearing in the summary.
[6] For the cities for which deaths are shown by color the percentage of colored population in 1930 was as follows: Atlanta, 33; Baltimore, 18; Birmingham, 38; Dallas, 17; Fort Worth, 16; Houston, 27; Indianapolis, 12; Kansas City, Kans., 19; Knoxville, 16; Louisville, 15; Memphis, 38; Miami, 23; Nashville, 28; New Orleans, 29; Richmond, 29; Tampa, 21; and Washington, D. C., 27.
[7] Mortality rates based upon population Apr. 1, 1930; decreased 1920 to 1930; no estimate made.
[8] Cities with no infant mortality rate are not in the registration area for births.

DEATHS DURING WEEK ENDED JANUARY 9, 1932

Summary of information received by telegraph from industrial insurance companies for the week ended January 9, 1932, and corresponding week of 1931. (From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce)

	Week ended Jan. 9, 1932	Corresponding week, 1931
Policies in force	74,255,940	75,144,856
Number of death claims	13,082	15,212
Death claims per 1,000 policies in force, annual rate	9.2	10.6

Deaths [1] from all causes in certain large cities of the United States during the week ended January 9, 1932, infant mortality, annual death rate, and comparison with corresponding week of 1931. (From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce)

[The rates published in this summary are based upon mid-year population estimates derived from the 1930 census]

City	Week ended Jan. 9, 1932				Corresponding week, 1931	
	Total deaths	Death rate [2]	Deaths under 1 year	Infant mortality rate [3]	Death rate [2]	Deaths under 1 year
Total (83 cities)	9,066	13.0	633	[4] 54	14.1	877
Akron	53	10.4	4	50	9.5	5
Albany [5]	46	18.4	3	61	17.0	3
Atlanta [6]	110	20.3	10	97	16.5	7
White	53	14.8	8	118	15.3	4
Colored	57	31.1	2	57	19.0	3
Baltimore [5 6]	236	15.0	27	96	15.6	23
White	183	14.3	18	82	14.9	17
Colored	53	18.4	9	145	19.2	6
Birmingham [6]	81	15.3	10	104	15.7	5
White	43	13.1	7	115	8.8	2
Colored	38	18.9	3	81	26.9	3
Boston	237	15.7	20	60	14.7	23
Bridgeport	39	13.8	7	125	16.7	4
Buffalo	160	14.2	10	48	13.4	15
Cambridge	36	16.4	3	62	13.7	4
Camden	29	12.7	5	88	17.5	4
Canton	23	11.1	3	75	9.3	0
Chicago [5]	834	12.4	70	69	11.5	66
Cincinnati	144	16.3	4	26	21.8	11
Cleveland	214	12.1	13	42	11.3	15
Columbus	109	19.0	6	60	15.0	1
Dallas [6]	66	12.2	6	----------	14.5	6
White	43	9.6	2	----------	13.4	6
Colored	23	24.7	4	----------	19.8	0
Dayton	50	11.0	5	72	14.4	7
Denver	139	24.7	9	88	16.4	12
Des Moines	30	10.7	0	0	12.6	3
Detroit	300	9.1	22	40	8.7	38
Duluth	20	10.3	3	87	13.3	1
El Paso	36	17.6	4	----------	26.3	19
Erie	20	8.8	0	0	10.2	3
Fall River [5 7]	24	10.9	1	27	11.8	1
Flint	30	9.2	4	59	7.0	4
Fort Worth [6]	30	9.2	3	----------	15.0	7
White	22	8.0	2	----------	11.9	5
Colored	8	15.7	1	----------	30.7	2
Grand Rapids	23	6.9	0	0	7.6	3
Houston [6]	70	11.3	2	----------	12.6	7
White	45	9.9	1	----------	12.2	6
Colored	25	15.2	1	----------	13.8	1
Indianapolis [5]	106	14.8	7	57	14.5	8
White	84	13.4	5	46	14.1	7
Colored	22	25.0	2	137	17.3	1
Jersey City	78	12.7	4	33	12.7	9
Kansas City, Kans. [6]	40	16.9	3	66	16.1	5
White	35	18.3	3	80	14.7	3
Colored	5	11.0	0	0	22.2	2
Kansas City, Mo.	71	8.9	2	23	14.7	15
Knoxville [6]	19	8.9	2	51	15.8	3
White	14	7.8	2	56	13.1	2
Colored	5	14.3	0	0	29.3	1
Long Beach	39	12.7	2	52	9.9	3
Los Angeles	351	13.3	16	47	14.8	29
Louisville [5]	84	14.2	7	64	25.4	14
White	65	13.0	5	52	24.0	10
Colored	19	20.8	2	149	32.8	4
Lowell [7]	25	13.0	1	26	14.6	1
Lynn	27	13.7	3	85	14.2	3
Memphis [6]	78	15.5	7	76	17.7	7
White	38	12.2	3	51	17.3	3
Colored	40	20.8	4	120	18.5	4
Miami [6]	32	14.7	0	0	10.2	3
White	23	13.6	0	0	10.8	1
Colored	9	18.6	0	0	8.2	2

See footnotes at end of table.

Deaths [1] from all causes in certain large cities of the United States during the week ended January 9, 1932, infant mortality, annual death rate, and comparison with corresponding week of 1931. (From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce)—Continued

City	Week ended Jan. 9, 1932				Corresponding week, 1931	
	Total deaths	Death rate [2]	Deaths under 1 year	Infant mortality rate [3]	Death rate [2]	Deaths under 1 year
Milwaukee	124	10.8	11	52	10.6	13
Minneapolis	93	10.1	5	33	14.1	19
Nashville [4]	43	16.0	1	15	16.4	8
White	32	14.7	0	0	13.4	5
Colored	16	19.5	1	62	24.4	3
New Bedford [7]	30	13.9	4	115	15.3	5
New Haven	41	13.2	1	20	14.1	3
New Orleans [4]	157	17.3	9	51	21.7	17
White	93	14.4	6	52	18.6	9
Colored	64	24.4	3	49	29.4	8
New York	1,663	12.0	106	47	14.1	154
Bronx Borough	250	9.5	12	35	9.3	21
Brooklyn Borough	526	10.3	42	46	13.4	57
Manhattan Borough	631	18.6	38	54	21.3	59
Queens Borough	200	8.6	12	50	9.6	16
Richmond Borough	56	17.5	2	39	15.6	1
Newark, N. J.	96	11.2	11	60	12.8	13
Oakland	71	12.4	7	88	15.9	7
Oklahoma City	47	11.9	5	68	12.5	7
Omaha	60	14.3	5	56	13.7	6
Paterson	42	15.8	1	18	13.1	2
Peoria	28	13.2	0	0	14.9	0
Philadelphia	541	14.3	35	54	15.6	42
Pittsburgh	211	16.2	20	92	16.6	32
Portland, Oreg.	85	14.3	0	0	15.6	1
Providence	90	18.4	2	19	16.8	9
Richmond [4]	65	18.3	6	90	16.7	4
White	42	16.6	3	67	16.3	4
Colored	23	22.8	3	138	17.7	0
Rochester	74	11.5	3	29	14.8	4
St. Louis	214	13.4	19	68	16.7	31
St. Paul	50	9.3	6	64	11.9	5
Salt Lake City [5]	37	13.3	3	47	13.9	4
San Antonio	59	12.5	6		15.2	13
San Diego	46	14.7	0	0	19.3	5
San Francisco	216	17.0	10	69	12.6	3
Schenectady	21	11.4	1	29	8.7	1
Seattle	88	12.2	0	0	12.6	4
Somerville	27	13.3	3	121	14.4	4
South Bend	17	8.0	0	0	5.8	1
Spokane	36	16.1	0	0	10.8	1
Springfield, Mass.	41	13.9	3	51	11.6	2
Syracuse	41	9.9	3	39	13.7	7
Tacoma	20	9.6	1	28	13.1	1
Tampa [4]	21	10.2	1	29	19.9	4
White	17	10.4	0	0	18.3	2
Colored	4	9.2	1	158	25.8	2
Toledo	65	11.3	4	43	12.3	10
Trenton	45	18.9	2	40	26.5	8
Utica	23	11.7	0	0	14.8	0
Washington, D. C. [6]	133	14.1	10	56	19.4	14
White	83	12.1	4	33	17.3	6
Colored	50	19.1	6	107	25.1	8
Waterbury	17	8.7	2	66	8.8	1
Wilmington, Del. [7]	33	16.2	5	113	19.1	5
Worcester	55	14.5	9	126	13.0	2
Yonkers	24	8.8	2	52	10.5	0
Youngstown	32	9.5	3	49	14.1	8

[1] Deaths of nonresidents are included. Stillbirths are excluded.

[2] These rates represent annual rates per 1,000 population, as estimated for 1932 and 1931 by the arithmetical method.

[3] Deaths under 1 year of age per 1,000 live births. Cities left blank are not in the registration area for births.

[4] Data for 78 cities.

[5] Deaths for week ended Friday.

[6] For the cities for which deaths are shown by color the percentages of colored population in 1930 were as follows: Atlanta, 33; Baltimore, 18; Birmingham, 38; Dallas, 17; Fort Worth, 16; Houston, 27; Indianapolis, 12; Kansas City, Kans., 19; Knoxville, 16; Louisville, 15; Memphis, 38; Miami, 23; Nashville, 26; New Orleans, 29; Richmond, 29; and Washington, D. C., 27.

[7] Population Apr. 1, 1930; decreased 1920 to 1930, no estimate made.

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers

Reports for Weeks Ended January 16, 1932, and January 17, 1931

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended January 16, 1932, and January 17, 1931

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Jan. 16, 1932	Week ended Jan. 17, 1931	Week ended Jan. 16, 1932	Week ended Jan. 17, 1931	Week ended Jan. 16, 1932	Week ended Jan. 17, 1931	Week ended Jan. 16, 1932	Week ended Jan. 17, 1931
New England States:								
Maine	5	5	51	4	541	21	0	0
New Hampshire	2	2	1	----	15	45	0	0
Vermont	----	----	----	----	205	25	0	0
Massachusetts	60	77	35	17	450	409	3	1
Rhode Island	8	7	----	----	789	----	0	1
Connecticut	7	10	6	82	122	192	2	1
Middle Atlantic States:								
New York	172	135	[1] 28	[1] 1,005	1,048	279	10	14
New Jersey	32	56	16	282	60	313	1	6
Pennsylvania	128	129	----	----	93	966	6	2
East North Central States:								
Ohio	99	62	44	34	374	126	1	6
Indiana	107	64	47	5	53	197	11	16
Illinois	134	165	67	41	63	555	4	14
Michigan	49	58	1	5	140	82	4	5
Wisconsin	30	15	21	38	264	229	1	3
West North Central States:								
Minnesota	17	14	4	1	22	16	1	3
Iowa	18	10	----	----	3	5	0	2
Missouri	43	37	4	12	15	1,012	0	3
North Dakota	1	5	----	----	42	----	0	0
South Dakota	12	15	4	----	61	3	0	1
Nebraska	13	6	----	7	22	16	0	3
Kansas	48	22	2	4	28	19	2	1
South Atlantic States:								
Delaware	6	2	2	----	1	3	0	0
Maryland [2]	46	24	43	113	16	160	0	1
District of Columbia	19	10	----	10	1	17	0	0
Virginia	----	----	----	----	----	----	2	4
West Virginia	38	23	18	33	379	47	0	1
North Carolina	49	42	23	112	115	----	4	4
South Carolina	15	11	431	1,078	59	----	0	0
Georgia [2]	9	16	57	168	2	----	1	2
Florida	29	13	3	6	16	65	0	2

[1] New York City only.
[2] Week ended Friday.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended January 16, 1932, and January 17, 1931—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Jan. 16, 1932	Week ended Jan. 17, 1931	Week ended Jan. 16, 1932	Week ended Jan. 17, 1931	Week ended Jan. 16, 1932	Week ended Jan. 17, 1931	Week ended Jan. 16, 1932	Week ended Jan. 17, 1931
East South Central States:								
Kentucky	55	23	127	2	59	----	0	4
Tennessee	43	10	81	121	22	96	5	2
Alabama	48	22	42	126	2	370	1	4
Mississippi	23	20	----	----	----	----	0	2
West South Central States:								
Arkansas	15	8	7	101	5	1	0	2
Louisiana	29	26	14	77	5	2	2	5
Oklahoma [4]	57	38	66	169	21	16	0	1
Texas [3]	134	41	46	85	2	9	1	1
Mountain States:								
Montana	2	7	2	----	117	3	1	0
Idaho	1	1	----	1	1	29	1	1
Wyoming	1	----	----	----	3	1	0	0
Colorado	8	12	----	----	7	49	2	4
New Mexico	21	4	5	1	4	35	0	4
Arizona	8	12	17	3	5	50	1	7
Utah [3]	1	----	----	12	----	3	0	4
Pacific States:								
Washington	3	10	----	----	223	76	2	3
Oregon	2	2	58	49	13	57	0	0
California	89	63	177	63	250	363	3	8

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Jan. 16, 1932	Week ended Jan. 17, 1931	Week ended Jan. 16, 1932	Week ended Jan. 17, 1931	Week ended Jan. 16, 1932	Week ended Jan. 17, 1931	Week ended Jan. 16, 1932	Week ended Jan. 17, 1931
New England States:								
Maine	1	1	29	14	0	0	2	2
New Hampshire	0	0	13	10	0	0	0	1
Vermont	0	0	2	8	12	0	0	1
Massachusetts	2	2	495	334	17	0	5	4
Rhode Island	0	1	42	30	0	0	0	0
Connecticut	0	0	70	68	8	0	0	2
Middle Atlantic States:								
New York	5	7	893	694	4	14	17	13
New Jersey	0	0	238	250	0	1	1	4
Pennsylvania	3	4	565	557	0	1	12	20
East North Central States:								
Ohio	2	7	577	550	35	117	8	11
Indiana	2	1	124	266	14	94	3	0
Illinois	6	9	386	512	21	72	14	5
Michigan	1	2	313	373	5	48	3	2
Wisconsin	1	3	83	138	6	3	2	0
West North Central States:								
Minnesota	0	2	94	62	6	8	0	3
Iowa	0	0	46	101	41	60	0	1
Missouri	0	2	75	126	10	80	2	2
North Dakota	0	0	10	18	4	7	1	0
South Dakota	0	0	10	16	21	57	2	1
Nebraska	0	1	27	41	5	63	0	0
Kansas	0	0	72	60	2	172	3	4
South Atlantic States:								
Delaware	0	0	3	16	0	0	0	0
Maryland [3]	0	0	105	106	0	0	4	6
District of Columbia	0	0	23	26	0	0	2	2
Virginia	----	----	----	----	----	1	----	----
West Virginia	0	0	48	48	2	11	14	2
North Carolina	6	2	85	81	1	3	10	4
South Carolina	1	7	9	24	0	2	15	5
Georgia [3]	0	1	10	56	0	0	8	1
Florida	0	1	10	15	0	0	5	1

[3] Week ended Friday.
[3] Typhus fever, week ended Jan. 16, 1932, 2 cases: 1 case in Georgia and 1 case in Texas.
[4] Figures for 1932 are exclusive of Oklahoma City and Tulsa.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended January 16, 1932, and January 17, 1931—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Jan. 16, 1932	Week ended Jan. 17, 1931	Week ended Jan. 16, 1932	Week ended Jan. 17, 1931	Week ended Jan. 16, 1932	Week ended Jan. 17, 1931	Week ended Jan. 16, 1932	Week ended Jan. 17, 1931
East South Central States:								
Kentucky	2	0	157	75	4	2	23	3
Tennessee	0	1	73	23	12	7	14	3
Alabama	0	0	36	48	157	2	21	4
Mississippi	0	0	28	19	16	14	4	3
West South Central States:								
Arkansas	1	0	13	15	33	29	6	4
Louisiana	0	1	26	26	7	12	10	6
Oklahoma [4]	1	1	48	60	9	59	7	8
Texas [2]	1	1	62	63	28	187	5	4
Mountain States:								
Montana	0	0	22	43	2	18	2	1
Idaho	0	0	6	17	3	4	1	0
Wyoming	0	0	7	7	0	0	0	0
Colorado	0	0	47	41	2	11	1	3
New Mexico	1	1	10	10	1	2	4	3
Arizona	0	0	12	8	1	1	0	0
Utah [2]	0	0	8	11	0	0	1	1
Pacific States:								
Washington	0	1	44	54	17	34	1	3
Oregon	0	0	24	16	31	25	2	1
California	2	10	158	137	12	156	2	6

[2] Week ended Friday.
[3] Typhus fever, week ended Jan. 16, 1932, 2 cases: 1 case in Georgia and 1 case in Texas.
[4] Figures for 1932 are exclusive of Oklahoma City and Tulsa.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week:

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
November, 1931										
Delaware	2	144	4	----	2	----	0	36	0	3
December, 1931										
Delaware	----	53	----	----	6	----	1	33	0	3
District of Columbia	3	574	228	----	8	----	1	81	0	3
Florida	3	54	6	32	4	5	1	36	3	15
Massachusetts	8	260	31	----	1,229	4	19	1,495	0	32
Michigan	15	264	16	1	294	----	15	1,231	46	39
New Mexico	2	94	2	1	23	1	1	60	1	30
North Dakota	1	53	1	----	48	----	3	89	49	2
Ohio	9	535	94	----	534	----	12	2,071	77	67
Vermont	----	2	----	----	566	----	2	49	54	1
Wyoming	----	11	----	----	26	----	0	43	4	1

November, 1931

Delaware:	Cases
Chicken pox	13
Mumps	5
Whooping cough	28

December, 1931

	Cases
Anthrax:	
Massachusetts	1
Chicken pox:	
Delaware	39
District of Columbia	27
Florida	25
Massachusetts	913
Michigan	1,149
New Mexico	221
North Dakota	135
Ohio	2,460
Vermont	332
Wyoming	51
Conjunctivitis:	
Wyoming	1
Diarrhea and enteritis (under 2 years):	
Ohio	16
Dysentery:	
Florida	2
Massachusetts	5
New Mexico	1
Ohio	1
Food poisoning:	
Ohio	4
German measles:	
Massachusetts	59
Ohio	16
Lead poisoning:	
Massachusetts	4
Ohio	13
Lethargic encephalitis:	
Florida	1
Massachusetts	2
Michigan	1
Ohio	7
Mumps:	
Delaware	13
Florida	33
Massachusetts	745
Michigan	638
New Mexico	27
North Dakota	12
Ohio	676
Mumps—Continued.	
Vermont	48
Wyoming	44
Ophthalmia neonatorum:	
Massachusetts	80
Ohio	37
Puerperal septicemia:	
Ohio	6
Septic sore throat:	
Massachusetts	30
Michigan	30
New Mexico	1
Ohio	98
Tetanus:	
Massachusetts	2
Ohio	2
Trachoma:	
Massachusetts	4
North Dakota	2
Ohio	1
Trichinosis:	
Massachusetts	1
Tularemia:	
Michigan	3
New Mexico	1
Ohio	45
Wyoming	2
Typhus fever:	
District of Columbia	1
Florida	3
Undulant fever:	
District of Columbia	1
Massachusetts	2
Michigan	3
Ohio	11
Vermont	3
Vincent's angina:	
North Dakota	24
Whooping cough:	
Delaware	30
District of Columbia	70
Florida	13
Massachusetts	728
Michigan	968
New Mexico	6
North Dakota	11
Ohio	1,639
Vermont	156
Wyoming	10

RECIPROCAL NOTIFICATIONS

Notifications regarding communicable diseases sent during the month of December, 1931, by departments of health of States named to other State health departments

Disease	California	Connecticut	Illinois	Massachusetts	Minnesota	New Jersey	New York
Diphtheria					1		1
Dysentery (amoebic)				1			
Measles							1
Paratyphoid fever							1
Trachoma			3				
Tuberculosis	10		7		21		
Tularaemia					1		
Typhoid fever		1			1		1
Undulant fever						1	

PATIENTS IN INSTITUTIONS FOR FEEBLE-MINDED, OCTOBER TO DECEMBER, 1929

Reports for the fourth quarter of the year 1929 were received by the Public Health Service from 30 institutions for the care of the feeble-minded, located in 25 States. The total number of patients in these institutions on December 31, 1929, including those on temporary leave or otherwise absent but still on the books, was 34,789.

The first admissions were as follows:

	Male	Female	Total
October	208	162	370
November	168	161	329
December	120	106	226
Total	496	429	925

Of the first admissions during the three months, 53.6 per cent were males and 46.4 per cent were females, the ratio being 116 males per 100 females.

One hundred and seventy-six male patients and 208 female patients were discharged and 101 males and 71 females died during the three months. The annual death rates, based on the number of patients on the books December 31, 1929, were: Males, 23.2 per 1,000; females, 16.1 per 1,000; persons, 19.6 per 1,000.

The following table shows the number of patients in the institutions and on temporary leave on October 1, 1929, and at the end of each month of the fourth quarter of 1929, and the percentages of the total patients who were on leave:

	Oct. 1, 1929	Oct. 31, 1929	Nov. 30, 1929	Dec. 31, 1929
Patients in institutions:				
Male	14,408	14,564	14,592	14,349
Female	15,256	15,342	15,380	15,237
Total	29,664	29,906	29,972	29,586
Patients on temporary leave:				
Male	2,615	2,592	2,626	2,904
Female	2,122	2,114	2,165	2,299
Total	4,737	4,706	4,791	5,203
Total patients on books:				
Male	17,023	17,156	17,218	17,253
Female	17,378	17,456	17,545	17,536
Total	34,401	34,612	34,763	34,789
Per cent of total patients on temporary leave:				
Male	15.4	15.1	15.3	16.8
Female	12.2	12.1	12.3	13.1
Total	13.8	13.6	13.8	15.0

GENERAL CURRENT SUMMARY AND WEEKLY REPORTS FROM CITIES

The 95 cities reporting cases used in the following table are situated in all parts of the country and have an estimated aggregate population of more than 33,819,000. The estimated population of the 88 cities reporting deaths is more than 32,260,000. The estimated expectancy is based on the experience of the last nine years, excluding epidemics.

Weeks ended January 9, 1932, and January 10, 1931

	1932	1931	Estimated expectancy
Cases reported			
Diphtheria:			
46 States	1,760	1,365	----
95 cities	537	523	870
Measles:			
45 States	6,567	6,883	----
95 cities	1,905	2,214	----
Meningococcus meningitis:			
46 States	88	157	----
95 cities	53	60	----
Poliomyelitis:			
46 States	48	40	----
Scarlet fever:			
46 States	4,694	4,871	----
95 cities	1,773	1,762	1,369
Smallpox:			
46 States	483	895	----
95 cities	38	81	33
Typhoid fever:			
46 States	281	170	----
95 cities	27	25	31
Deaths reported			
Influenza and pneumonia:			
88 cities	1,000	1,233	----
Smallpox:			
88 cities	0	0	----

City reports for week ended January 9, 1932

The "estimated expectancy" given for diphtheria, poliomyelitis, scarlet fever, smallpox, and typhoid fever is the result of an attempt to ascertain from previous occurrence the number of cases of the disease under consideration that may be expected to occur during a certain week in the absence of epidemics. It is based on reports to the Public Health Service during the past nine years. It is in most instances the median number of cases reported in the corresponding weeks of the preceding years. When the reports include several epidemics, or when for other reasons the median is unsatisfactory, the epidemic periods are excluded, and the estimated expectancy is the mean number of cases reported for the week during nonepidemic years.

If the reports have not been received for the full nine years, data are used for as many years as possible, but no year earlier than 1923 is included. In obtaining the estimated expectancy, the figures are smoothed when necessary to avoid abrupt deviation from the usual trend. For some of the diseases given in the table the available data were not sufficient to make it practicable to compute the estimated expectancy.

Division, State, and city	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
		Cases, estimated expectancy	Cases reported	Cases reported	Deaths reported			
NEW ENGLAND								
Maine:								
Portland	8	0	2		0	130	0	2
New Hampshire:								
Concord	0	0	0		0	0	0	1
Nashua	4	0	0		0	0	0	0
Vermont:								
Barre	0	0	0		0	0	1	1
Burlington	1	0	0		0	21	2	0
Massachusetts:								
Boston	66	3	13	1	2	13	30	41
Fall River	5	4	3		1	4	0	1
Springfield	13	5	1		0	3	40	1
Worcester	18	4	4		0	1	103	4
Rhode Island:								
Pawtucket	0	1	0		0	0	0	0
Providence	0	8	7		0	561	38	9
Connecticut:								
Bridgeport	8	6	1	1	1	0	0	5
Hartford	14	6	2	1	0	0	9	0
New Haven	15	1	0	1	0	0	16	4
MIDDLE ATLANTIC								
New York:								
Buffalo	38	12	8		2	3	3	30
New York	244	196	85	26	13	32	78	175
Rochester	35	6	0		0	63	30	4
Syracuse	20	2	0		0	7	5	7
New Jersey:								
Camden	8	8	4	1	1	0	1	3
Newark	100	18	4	5	0	1	12	15
Trenton	4	2	0	1	0	2	10	1
Pennsylvania:								
Philadelphia	143	63	6	4	7	6	31	67
Pittsburgh	46	19	7	1	5	212	50	32
Reading	12	1	0		0	4	1	1
Scranton	2		0		0	0	0	0
EAST NORTH CENTRAL								
Ohio:								
Cincinnati	4	10	0		2	0	0	11
Cleveland	146	31	2	27	2	153	103	30
Columbus	25	4	17		2	5	7	5
Toledo	88	8	6	1	1	1	4	3
Indiana:								
Fort Wayne	5	4	22		1	0	0	4
Indianapolis	72	7	6		1	1	64	14
South Bend	9	1	0		0	0	0	0
Terre Haute	10	0	0		0	0	0	1
Illinois:								
Chicago	140	108	49	20	10	27	5	63
Springfield		1						
Michigan:								
Detroit	69	54	22	1	3	4	7	26
Flint	37	3	3		0	4	52	3
Grand Rapids	10	1	1		1	27	14	3

City reports for week ended January 9, 1932—Continued

Division, State, and city	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
		Cases, estimated expectancy	Cases reported	Cases reported	Deaths reported			
EAST NORTH CENTRAL—continued								
Wisconsin:								
Kenosha	14	0	2		0	0	0	0
Madison	4	1	2			1	0	
Milwaukee	129	16	3	5	2	15	40	11
Racine	21	1	0		0	2	49	0
Superior	0	0	0		0	1	28	2
WEST NORTH CENTRAL								
Minnesota:								
Duluth	11	1	0		0	0	1	3
Minneapolis	57	16	6		2	0	10	9
St. Paul	26	5	4		0	3	6	3
Iowa:								
Davenport	0	0	0			0	0	
Des Moines	0	1	1			0	0	
Sioux City	13	1	5			0	1	
Waterloo	15	0	0			0	0	
Missouri:								
Kansas City	41	6	14		0	3	9	5
St. Joseph	2	1	1		0	0	0	2
St. Louis	20	42	20	2	1	1	1	8
North Dakota:								
Fargo		0						
Grand Forks	1	0	0			0	0	
South Dakota:								
Aberdeen	14	0	0			21	0	
Nebraska:								
Omaha	20	5	8		0	3	0	7
Kansas:								
Topeka	11	1	2		0	0	0	2
Wichita	21	2	9		0	24	0	5
SOUTH ATLANTIC								
Delaware:								
Wilmington	11	3	0		0	0	4	9
Maryland:								
Baltimore	63	23	11	14	5	1	52	26
Cumberland	2	0	1		0	0	0	1
Frederick	0	0	3		0	0	0	0
District of Columbia:								
Washington	9	16	19	3	2	2	0	15
Virginia:								
Lynchburg	3	2	2		2	0	0	2
Norfolk	17	2	4	1	0	1	0	4
Richmond	3	6	7		0	0	0	6
Roanoke	4	2	1		1	0	0	1
West Virginia:								
Charleston	5	1	0	1	1	0	0	2
Huntington	2		3		0	0	0	0
Wheeling	11	1	0		0	0	0	0
North Carolina:								
Raleigh	9	1	0		0	23	0	2
Wilmington	4	1	2		0	0	0	1
Winston-Salem	4	1	2	7	1	0	4	2
South Carolina:								
Charleston	1	0	0	38	0	0	0	4
Columbia	0	0	0		0	0	0	7
Greeneville	1	0	0		0	0	0	0
Georgia:								
Atlanta	5	3	3	40	4	0	1	17
Brunswick	0	0	0		0	0	2	0
Savannah	1	1	3	11	2	1	0	4
Florida:								
Miami	0	2	3		0	0	0	1
Tampa	1	2	4		0	0	0	1

City reports for week ended January 9, 1932—Continued

Division, State, and city	Chicken pox, cases reported	Diphtheria		Influenza		Measles, cases reported	Mumps, cases reported	Pneumonia, deaths reported
		Cases, estimated expectancy	Cases reported	Cases reported	Deaths reported			
EAST SOUTH CENTRAL								
Kentucky:								
Covington	0	1	1		0	0	0	0
Lexington	4		0		0	0	10	2
Tennessee:								
Memphis	8	5	15		0	0	0	8
Nashville	5	1	4		1	0	0	6
Alabama:								
Birmingham	4	5	3	4	4	1	0	8
Mobile	0	1	3	2	0	1	0	5
Montgomery	0	1	2			1	5	
WEST SOUTH CENTRAL								
Arkansas:								
Fort Smith	1	1	1			1	0	
Little Rock	0	1	3		0	0	7	3
Louisiana:								
New Orleans	0	13	16	6	3	0	0	9
Shreveport	2	2	1		0	10	1	2
Oklahoma:								
Tulsa	3	2	1			0	1	
Texas:								
Dallas	2	11	20	1	1	0	2	7
Fort Worth	3	5	7		0	0	0	3
Galveston	0	1	1		0	0	0	2
Houston	0	8	13		1	0	0	8
San Antonio	1	3	7		4	2	1	7
MOUNTAIN								
Montana:								
Billings	0	0	0		0	11	0	0
Great Falls	1	0	0	1	1	1	0	0
Helena	0	0	0		0	121	0	0
Missoula	1	0	0		0	0	0	1
Idaho:								
Boise	3	0	1		0	0	2	0
Colorado:								
Denver	18	7	11		10	2	21	24
Pueblo	22	1	0		0	0	0	3
New Mexico:								
Albuquerque	8	0	0		0	2	0	0
Arizona:								
Phoenix	1		3		0	0	0	2
Utah:								
Salt Lake City		3						
Nevada:								
Reno	0	0	0		0	0	0	1
PACIFIC								
Washington:								
Seattle	50	4	1			304	21	
Spokane	30	1	0			1	0	
Tacoma	15	2	0		0	2	4	5
Oregon:								
Portland	36	8	3	1	1	5	19	5
Salem	3	0	0	2	0	0	1	1
California:								
Los Angeles	84	36	28	72	4	1	11	39
Sacramento	25	3	0	1	1	90	1	19
San Francisco	110	14	5	13	5	14	0	9

City reports for week ended January 9, 1932—Continued

Division, State, and city	Scarlet fever		Smallpox			Tuberculosis, deaths reported	Typhoid fever			Whooping cough, cases reported	Deaths, all causes
	Cases, estimated expectancy	Cases reported	Cases, estimated expectancy	Cases reported	Deaths reported		Cases, estimated expectancy	Cases reported	Deaths reported		
NEW ENGLAND											
Maine:											
Portland	3	2	0	0	0	0	0	0	0	3	22
New Hampshire:											
Concord	0	2	0	0	0	0	0	0	0	0	16
Nashua	0	0	0	0	0	0	0	0	0	0	----
Vermont:											
Barre	0	0	0	0	0	0	0	0	0	4	3
Burlington	1	0	0	1	0	0	0	0	0	0	6
Massachusetts:											
Boston	87	122	0	0	0	15	1	0	0	47	237
Fall River	3	6	0	0	0	0	0	0	0	3	24
Springfield	9	5	0	0	0	1	0	0	0	3	39
Worcester	13	33	0	0	0	2	0	0	0	8	55
Rhode Island:											
Pawtucket	2	0	0	0	0	0	0	0	0	0	14
Providence	14	25	0	0	0	7	0	0	0	12	90
Connecticut:											
Bridgeport	10	8	0	11	0	3	0	0	0	6	39
Hartford	8	18	0	0	0	2	0	1	0	22	42
New Haven	5	8	0	0	0	1	0	0	0	1	41
MIDDLE ATLANTIC											
New York:											
Buffalo	25	62	0	0	0	7	1	1	1	29	158
New York	209	280	0	0	0	107	8	6	2	144	1,663
Rochester	11	61	0	0	0	0	0	0	0	7	68
Syracuse	13	13	0	0	0	0	0	0	0	70	45
New Jersey:											
Camden	6	17	0	0	0	1	1	0	0	6	29
Newark	22	18	0	0	0	9	0	0	0	48	100
Trenton	5	6	0	0	0	2	0	0	0	2	45
Pennsylvania:											
Philadelphia	93	147	0	0	0	24	2	3	1	190	541
Pittsburgh	37	42	0	0	0	8	0	1	0	27	211
Reading	4	1	0	0	0	0	0	0	0	3	18
Scranton	----	19	----	0	0	0	----	0	0	[1] 1	0
EAST NORTH CENTRAL											
Ohio:											
Cincinnati	21	40	1	0	0	9	0	0	0	8	144
Cleveland	43	70	0	0	0	10	2	0	0	164	214
Columbus	12	18	0	0	0	6	0	0	0	18	109
Toledo	14	14	1	0	0	3	0	1	0	93	65
Indiana:											
Fort Wayne	5	5	0	0	0	2	0	1	0	1	23
Indianapolis	11	8	5	0	0	6	0	0	0	16	----
South Bend	3	1	0	0	0	2	0	0	0	0	17
Terre Haute	2	2	0	0	0	0	0	0	0	0	12
Illinois:											
Chicago	132	194	1	1	0	42	2	0	0	164	834
Springfield	3	----	0	----	----	----	0	----	----	----	----
Michigan:											
Detroit	103	92	1	0	0	25	2	2	0	115	----
Flint	13	7	1	0	0	3	0	0	0	13	30
Grand Rapids	13	9	0	0	0	1	0	0	0	6	23
Wisconsin:											
Kenosha	2	3	0	0	0	0	0	0	0	2	7
Madison	4	2	0	0	----	----	0	0	----	1	----
Milwaukee	32	45	0	0	0	10	1	0	0	147	124
Racine	6	1	0	0	0	1	0	0	0	7	11
Superior	2	0	0	0	0	0	0	0	0	0	19

[1] Nonresident.

City reports for week ended January 9, 1932—Continued

Division, State, and city	Scarlet fever		Smallpox			Tuberculosis, deaths reported	Typhoid fever			Whooping cough, cases reported	Deaths, all causes
	Cases, estimated expectancy	Cases reported	Cases, estimated expectancy	Cases reported	Deaths reported		Cases, estimated expectancy	Cases reported	Deaths reported		
WEST NORTH CENTRAL											
Minnesota											
Duluth	11	0	0	0	0	0	0	0	0	1	20
Minneapolis	46	37	0	0	0	4	0	0	0	17	93
St. Paul	28	17	1	0	0	1	0	0	0	7	52
Iowa:											
Davenport	2	9	1	0	----	----	0	0	----	0	----
Des Moines	8	7	1	0	----	----	0	0	----	0	30
Sioux City	1	1	1	2	----	----	0	0	----	5	1
Waterloo	1	0	0	0	----	----	0	0	----	8	----
Missouri:											
Kansas City	18	23	0	0	0	9	0	1	0	26	71
St. Joseph	1	2	0	0	0	1	0	0	0	0	18
St. Louis	43	27	1	0	0	13	0	0	0	51	214
North Dakota:											
Fargo	3	----	0	----	----	----	0	----	----	----	----
Grand Forks	1	3	0	0	----	----	0	0	----	0	----
South Dakota:											
Aberdeen	0	0	0	0	----	----	0	0	----	9	----
Nebraska:											
Omaha	6	8	2	1	)	1	)	0	0	0	60
Kansas:											
Topeka	4	2	0	0	0	0	0	0	0	16	17
Wichita	3	4	0	0	0	0	0	0	0	1	38
SOUTH ATLANTIC											
Delaware:											
Wilmington	5	8	0	0	0	2	0	0	0	4	33
Maryland:											
Baltimore	32	34	0	0	0	11	2	0	0	132	236
Cumberland	1	2	0	0	0	0	0	1	0	1	8
Frederick	0	2	0	0	0	0	0	0	0	0	4
Dist. of Columbia:											
Washington	25	23	0	0	0	5	1	1	0	17	133
Virginia:											
Lynchburg	1	3	0	0	0	1	0	0	0	2	13
Norfolk	2	6	0	0	0	4	0	0	0	2	----
Richmond	8	15	0	0	0	6	0	0	0	1	68
Roanoke	2	4	0	0	0	0	0	0	0	0	21
West Virginia:											
Charleston	1	1	0	0	0	0	0	[1] 1	0	0	[2] 16
Huntington	----	0	----	0	0	0	----	1	0	0	----
Wheeling	2	1	0	0	0	0	0	1	0	8	18
North Carolina:											
Raleigh	1	3	0	0	0	0	0	0	0	0	13
Wilmington	0	0	0	0	0	1	0	0	0	11	7
Winston-Salem	3	2	1	0	0	2	0	0	0	4	14
South Carolina:											
Charleston	0	4	0	0	0	1	0	0	0	0	26
Columbia	1	4	0	0	0	1	0	0	0	3	40
Greenville	----	0	0	0	0	0	----	0	0	0	----
Georgia:											
Atlanta	7	9	0	0	0	9	0	0	0	2	110
Brunswick	0	0	0	0	0	0	0	0	0	0	4
Savannah	1	1	0	0	0	1	0	0	0	4	31
Florida:											
Miami	1	1	0	0	0	0	0	0	0	0	32
Tampa	1	0	0	0	0	0	0	0	0	1	22
EAST SOUTH CENTRAL											
Kentucky:											
Covington	1	10	0	0	0	1	0	0	0	0	21
Lexington	----	0	----	0	0	0	----	0	0	6	16
Tennessee:											
Memphis	8	10	1	4	0	1	1	0	0	15	78
Nashville	3	2	0	0	0	0	0	0	0	8	48
Alabama:											
Birmingham	5	10	1	0	0	3	1	0	0	1	81
Mobile	1	6	0	0	0	1	0	0	0	0	24
Montgomery	1	1	0	0	----	----	0	0	----	1	----

[1] Nonresident.

[2] 4 nonresidents, inclusive.

City reports for week ended January 9, 1932—Continued

Division, State, and city	Scarlet fever		Smallpox			Tuberculosis, deaths reported	Typhoid fever			Whooping cough, cases reported	Deaths, all causes
	Cases, estimated expectancy	Cases reported	Cases, estimated expectancy	Cases reported	Deaths reported		Cases, estimated expectancy	Cases reported	Deaths reported		
WEST SOUTH CENTRAL											
Arkansas:											
Fort Smith	1	1	0	0			0	0		1	
Little Rock	2	0	0	4	0	2	0	0	0	6	5
Louisiana:											
New Orleans	7	6	0	2	0	20	3	1	2	1	157
Shreveport	2	1	0	0	0	2	0	0	0	2	37
Oklahoma:											
Tulsa	2	2	0	0			0	0		5	
Texas:											
Dallas	7	7	0	0	0	1	0	0	0	11	66
Fort Worth	2	6	1	1	0	1	0	0	0	0	35
Galveston	0	0	0	0	0	0	0	0	0	0	15
Houston	4	6	3	2	0	2	0	1	0	2	70
San Antonio	1	0	0	0	0	6	0	2	0	0	59
MOUNTAIN											
Montana:											
Billings	1	0	0	0	0	0	0	0	0	0	11
Great Falls	4	1	0	0	0	1	0	0	0	0	5
Helena	0	0	0	0	0	0	0	0	0	2	2
Missoula	0	0	0	0	0	1	0	0	0	0	4
Idaho:											
Boise	0	0	0	1	0	0	0	0	0	0	6
Colorado:											
Denver	14	30	0	0	0	6	0	0	0	2	127
Pueblo	1	0	0	0	0	0	0	1	0	0	13
New Mexico:											
Albuquerque	1	0	0	0	0	4	0	0	0	0	16
Arizona:											
Phoenix	0	2	0	0	0	4	0	0	1	0	
Utah:											
Salt Lake City	3		0				1				
Nevada:											
Reno	0	0	0	0	0	0	0	0	0	0	5
PACIFIC											
Washington:											
Seattle	10	7	2	1			1	0		14	
Spokane	7	7	3	0			0	1		0	
Tacoma	2	0	2	0	0	0	0	0	0	0	20
Oregon:											
Portland	6	5	6	2	0	2	0	1	0	3	
Salem	0	0		0	0	0		1	0	1	14
California:											
Los Angeles	37	46	3	6	0	29	1	0	0	21	351
Sacramento	2	2	1	0	0	2	0	0	0	0	44
San Francisco	17	12	2	3	0	12	1	1	0	4	216

Division, State, and city	Meningococcus meningitis		Lethargic encephalitis		Pellagra		Poliomyelitis (infantile paralysis)		
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases, estimated expectancy	Cases	Deaths
MIDDLE ATLANTIC									
New York:									
New York City	13	5	1	0	0	0	2	4	1
Syracuse	0	0	0	0	0	0	0	1	0
New Jersey:									
Newark	0	2	1	0	0	0	0	0	0
Pennsylvania:									
Philadelphia	3	1	0	0	0	0	0	0	0
Pittsburgh	1	1	0	0	0	0	0	0	0
Scranton	0	0	[1]1	0	0	0		0	0

[1] Nonresident.

City reports for week ended January 9, 1932—Continued

Division, State, and city	Meningococcus meningitis		Lethargic encephalitis		Pellagra		Poliomyelitis (infantile paralysis)		
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases, estimated expectancy	Cases	Deaths
EAST NORTH CENTRAL									
Ohio:									
Cleveland	1	1	0	0	0	0	0	0	0
Indiana:									
Indianapolis	9	3	0	0	0	0	0	0	0
Illinois:									
Chicago	10	5	0	0	0	0	0	2	1
Michigan:									
Detroit	1	1	0	0	0	0	0	1	0
Flint	0	0	1	0	0	0	0	0	0
Wisconsin:									
Milwaukee	1	0	0	0	0	0	0	0	0
WEST NORTH CENTRAL									
Minnesota:									
St. Paul	0	0	0	0	0	0	0	1	0
Iowa:									
Des Moines	1	0	0	0	0	0	0	0	0
Missouri:									
St. Louis	2	1	0	0	0	0	0	0	0
SOUTH ATLANTIC									
Maryland:									
Baltimore	0	0	1	0	0	0	0	0	0
District of Columbia:									
Washington	2	2	1	1	0	0	0	1	0
Virginia:									
Norfolk	1	0	0	0	0	0	0	0	0
South Carolina:									
Charleston	0	0	0	0	3	0	0	0	0
Georgia:									
Savannah [1]	0	0	0	0	3	0	0	0	0
EAST SOUTH CENTRAL									
Tennessee:									
Memphis	0	0	0	0	0	1	0	0	0
Nashville	0	1	0	0	0	1	0	0	0
WEST SOUTH CENTRAL									
Louisiana:									
New Orleans	0	0	0	0	1	1	0	0	0
Shreveport	0	0	0	0	0	2	0	0	0
Texas:									
Dallas	0	0	0	0	1	1	0	0	0
Fort Worth	0	0	0	0	0	2	0	0	0
San Antonio	0	0	0	1	0	0	0	0	0
MOUNTAIN									
Montana:									
Billings	1	0	0	0	0	0	0	0	0
Colorado:									
Denver	1	1	0	0	0	0	0	0	0
New Mexico:									
Albuquerque	1	0	0	0	0	0	0	0	0
Arizona:									
Phoenix	1	0	0	0	0	0	----	0	0
PACIFIC									
California:									
Los Angeles	4	1	0	0	1	0	1	0	0
San Francisco	0	1	0	0	0	0	0	3	0

[1] Typhus fever: 1 case at Savannah, Ga.

The following table gives the rates per 100,000 population for 98 cities for the 5-week period ended January 9, 1932, compared with those for a like period ended January 10, 1931. The population figures used in computing the rates are estimated mid-year populations for 1931 and 1932, respectively, derived from the 1930 census. The 98 cities reporting cases have an estimated aggregate population of more than 34,000,000. The 91 cities reporting deaths have more than 32,400,000 estimated population.

Summary of weekly reports from cities, December 6, 1931, to January 9, 1932—Annual rates per 100,000 population, compared with rates for the corresponding period of 1930–31 [1]

DIPHTHERIA CASE RATES

	Week ended—									
	Dec. 12, 1931	Dec. 13, 1930	Dec. 19, 1931	Dec. 20, 1930	Dec. 26, 1931	Dec. 27, 1930	Jan. 2, 1932	Jan. 3, 1931	Jan. 9, 1932	Jan. 10, 1931
98 cities	93	[2] 87	103	[2] 94	72	71	[2] 72	80	[4] 83	81
New England	70	128	84	143	65	75	[4] 85	116	79	79
Middle Atlantic	59	47	71	62	57	47	56	68	50	63
East North Central	86	120	104	116	69	102	[6] 65	91	[6] 76	97
West North Central	168	97	187	89	134	54	130	83	[7] 132	98
South Atlantic	118	122	118	108	99	86	71	62	114	85
East South Central	163	138	157	84	111	84	[8] 107	72	162	116
West South Central	287	[2] 132	199	[2] 202	115	143	129	136	204	142
Mountain	26	26	96	18	26	62	[9] 36	62	[10] 136	35
Pacific	61	55	82	83	41	40	[11] 64	55	65	61

MEASLES CASE RATES

98 cities	118	[2] 162	128	[2] 194	126	181	[2] 192	281	[4] 295	350
New England	656	273	637	271	945	305	[5] 1,213	208	1,706	490
Middle Atlantic	89	85	79	87	66	70	93	101	146	178
East North Central	28	26	60	28	32	27	[6] 94	55	[6] 144	63
West North Central	46	1,077	25	1,416	50	1,277	38	1,894	[7] 65	2,156
South Atlantic	22	80	26	138	14	124	79	322	53	434
East South Central	17	299	52	275	17	323	[8] 31	921	17	861
West South Central	17	[2] 11	44	[2] 18	41	24	64	24	43	20
Mountain	809	150	740	167	339	229	[9] 533	317	[10] 1,530	226
Pacific	210	26	214	6	259	16	[11] 445	24	784	33

SCARLET FEVER CASE RATES

98 cities	222	[2] 224	214	[2] 234	187	222	[2] 227	231	[4] 274	277
New England	397	259	438	351	389	353	[5] 541	327	549	433
Middle Atlantic	199	186	202	208	205	190	240	229	286	242
East North Central	281	315	264	306	227	285	[6] 234	261	[6] 298	363
West North Central	143	209	138	279	126	246	115	238	[7] 232	296
South Atlantic	176	260	201	208	107	78	221	202	227	276
East South Central	250	377	157	197	157	341	[8] 119	299	225	396
West South Central	142	[2] 84	101	[2] 73	41	59	108	108	69	68
Mountain	261	211	261	300	113	379	[9] 217	220	[10] 351	322
Pacific	153	71	94	83	61	85	[11] 109	73	141	72

[1] The figures given in this table are rates per 100,000 population, annual basis, and not the number of cases reported. Populations used are estimated as of July 1, 1932, and 1931, respectively.
[2] Shreveport, La., not included.
[3] Barre, Vt., Springfield, Ill., Covington, Ky., Boise, Idaho, and Spokane, Wash., not included.
[4] Springfield, Ill., Fargo, N. Dak., and Salt Lake City, Utah, not included.
[5] Barre, Vt., not included.
[6] Springfield, Ill., not included.
[7] Fargo, N. Dak., not included.
[8] Covington, Ky., not included.
[9] Boise, Idaho, not included.
[10] Salt Lake City, Utah, not included.
[11] Spokane, Wash., not included.

Summary of weekly reports from cities, December 6, 1931, to January 9, 1932—Annual rates per 100,000 population, compared with rates for the corresponding period of 1930–31—Continued

SMALLPOX CASE RATES

	Week ended—									
	Dec. 12, 1931	Dec. 13, 1930	Dec. 19, 1931	Dec. 20, 1930	Dec. 26, 1931	Dec. 27, 1930	Jan. 2, 1932	Jan. 3, 1931	Jan. 9, 1932	Jan. 10, 1931
98 cities	4	[2] 14	5	[2] 9	4	7	[2] 3	7	[4] 6	13
New England	7	0	55	0	14	0	[5] 12	0	26	0
Middle Atlantic	0	0	0	0	0	0	0	0	0	0
East North Central	2	3	4	6	4	2	[6] 7	5	[6] 1	15
West North Central	13	122	4	48	10	43	4	46	[7] 6	63
South Atlantic	0	0	0	0	0	0	0	0	0	2
East South Central	0	0	0	0	0	0	[8] 0	0	23	6
West South Central	17	[2] 7	3	[2] 15	7	17	0	17	26	37
Mountain	0	150	0	115	0	35	[9] 0	9	[10] 11	9
Pacific	10	6	2	10	8	20	[11] 6	10	19	18

TYPHOID FEVER CASE RATES

98 cities	9	[2] 8	5	[2] 8	6	7	[2] 5	5	[4] 4	4
New England	10	19	7	10	2	2	[5] 12	2	2	5
Middle Atlantic	6	6	5	3	4	3	3	4	5	2
East North Central	3	7	1	9	2	12	[6] 3	4	[6] 2	2
West North Central	6	6	0	8	4	6	2	2	[7] 2	0
South Atlantic	32	4	10	12	14	16	6	4	8	10
East South Central	17	18	23	36	12	18	[8] 38	48	0	12
West South Central	34	[2] 22	34	[2] 26	44	0	3	3	13	20
Mountain	0	0	0	9	0	9	[9] 0	18	[10] 11	17
Pacific	6	6	2	6	4	6	[11] 8	6	4	2

INFLUENZA DEATH RATES

91 cities	8	[2] 9	8	[2] 10	9	11	[12] 13	16	[4] 18	24
New England	5	5	5	2	7	2	[5] 2	7	10	5
Middle Atlantic	8	7	6	5	7	10	5	17	12	29
East North Central	3	5	6	10	5	7	[6] 10	7	[6] 14	12
West North Central	6	21	6	15	3	9	9	3	[7] 9	21
South Atlantic	12	24	12	20	12	24	18	20	35	28
East South Central	25	26	6	32	32	19	[8] 27	26	31	44
West South Central	7	[2] 11	17	[2] 23	24	32	45	93	30	76
Mountain	35	9	17	18	70	0	[9] 135	18	[10] 125	44
Pacific	14	7	14	10	7	17	14	10	23	22

PNEUMONIA DEATH RATES

91 cities	98	[2] 106	106	[2] 111	101	126	[12] 121	164	[4] 144	187
New England	67	119	111	116	94	119	[5] 92	160	165	113
Middle Atlantic	108	104	116	127	101	126	126	184	148	233
East North Central	66	86	63	69	77	94	[6] 84	103	[6] 104	110
West North Central	112	150	103	96	118	117	103	180	[7] 133	200
South Atlantic	140	134	142	138	132	174	174	230	196	267
East South Central	113	123	120	110	113	149	[8] 151	207	169	265
West South Central	104	[2] 162	142	[2] 135	131	189	152	199	128	238
Mountain	87	159	200	220	226	194	[9] 172	264	[10] 329	244
Pacific	130	60	122	127	89	135	175	135	167	134

[2] Shreveport, La., not included.
[5] Barre, Vt., Springfield, Ill., Covington, Ky., Boise, Idaho, and Spokane, Wash., not included.
[4] Springfield, Ill., Fargo, N. Dak., and Salt Lake City, Utah, not included.
[5] Barre, Vt., not included.
[6] Springfield, Ill., not included.
[7] Fargo, N. Dak., not included.
[8] Covington, Ky., not included.
[9] Boise, Idaho, not included.
[10] Salt Lake City, Utah, not included.
[11] Spokane, Wash., not included.
[12] Salt Lake City, Utah, not included.

FOREIGN AND INSULAR

SMALLPOX ON VESSEL

The steamship *Bellasco* arrived at Mobile, Ala., January 17, 1932, with one case of smallpox on board, and another suspicious case. The entire crew was vaccinated and the vessel was held in quarantine. The *Bellasco* came from Hull, England, by way of Habana, Cuba.

CANADA

Provinces—Communicable diseases—Week ended January 2, 1932.—The Department of Pensions and National Health of Canada reports cases of certain communicable diseases for the week ended January 2, 1932, as follows:

Province	Cerebrospinal fever	Influenza	Lethargic encephalitis	Poliomyelitis	Smallpox	Typhoid fever
Prince Edward Island			1			
Nova Scotia [1]						
New Brunswick						1
Quebec	2			2	2	5
Ontario		1			2	7
Manitoba						2
Saskatchewan					1	
Alberta [1]						
British Columbia						1
Total	2	1	1	2	5	16

[1] No case of any disease included in the table was reported during the week.

Quebec Province—Communicable diseases—Week ended January 2, 1932.—The Bureau of Health of the Province of Quebec, Canada, reports cases of certain communicable diseases for the week ended January 2, 1932, as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	2	Poliomyelitis	2
Chicken pox	59	Scarlet fever	89
Diphtheria	40	Smallpox	2
Erysipelas	3	Tuberculosis	46
Measles	161	Typhoid fever	5
Mumps	21	Whooping cough	33

HONDURAS

Smallpox.—According to recent information, the epidemic of smallpox which began in June, 1931, in Honduras, had spread to many parts of the country, principally in the interior. The maritime ports continued free from the disease, with the exception of La Ceiba, where 14 cases were reported in September, and Trujillo, where 1 case was reported in August and 1 in September.

JAMAICA

Communicable diseases—Four weeks ended January 2, 1932.—During the four weeks ended January 2, 1932, cases of certain communicable diseases were reported in Kingston, Jamaica, and in the island of Jamaica, outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Chicken pox	8	7	Tuberculosis	46	68
Dysentery	1	9	Typhoid fever	16	45
Scarlet fever	1	1			

MEXICO

Tampico—Communicable diseases—December, 1931.—During the month of December, 1931, certain communicable diseases were reported in Tampico, Mexico, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	3		Paratyphoid fever		1
Enteritis, various		58	Tuberculosis		26
Influenza	3		Whooping cough	12	1
Malaria	643	14			

VIRGIN ISLANDS

Communicable diseases—November, December, 1931.—During the months of November and December, 1931, cases of certain communicable diseases were reported in the Virgin Islands as follows:

Disease	Cases		Disease	Cases	
	November	December		November	December
St. Thomas and St. John:			St. Croix—Continued.		
Chancroid		1	Gonorrhea		2
Gonorrhea	1	2	Leprosy		1
Syphilis	1	4	Malaria	2	
Saint Croix:			Syphilis		3
Chancroid		1	Tuberculosis		1
Filariasis		1			

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Hygiene, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following tables must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases; D, deaths; P, present]

Place		June 28–July 25, 1931	July 26–Aug. 22, 1931	Aug. 23–Sept. 19, 1931	Sept. 20–Oct. 17, 1931	Week ended— October, 1931		November, 1931				December, 1931				January, 1932		
						24	31	7	14	21	28	5	12	19	26	2	9	16
Ceylon: Colombo	C		3								1	1	1					
	D		3								1	1	1					
China:																		
Canton	C			2								3						
Hankow	C				8	5	18			6	5	3						
	D				6		1			4	1	1						
Shanghai	C	1	7	125	88	8												
	D			9	13	4												
Swatow	C	7																
India	C	22,074	36,514	39,223	26,705	4,237	4,419	3,648	3,418									
	D	12,093	20,276	21,683	13,257	2,252	2,360	2,400	1,789									
Bombay	C	23	44	42	4	4	1			1	3					1		
	D	16	25	17	3		1			1	4	1						
Calcutta	C	237	110	46	51	14	13	19	28	22	19	11	22	11	19			
	D	155	30	15	23	9	4	10	14	10	11	6	15	6	8			
Chittagong	C				1													
Karikal	C		1	2	1													
	D		1	2														
Madras	C	4	6	5														
Moulmein	C	1																
	D	1																
Negapatam	C			1														
Rangoon	C	4	1		1	1										1		
	D	1	1		1	1										1		
India (French):																		
Chandernagor	C	5	7	2	1	1								2				
	D	1	7	2	1	1								2				
Pondicherry	C	3	3	4	1													
	D	3	2	2														
India (Portuguese)	C	2	2	34	75	18	20	9	1	2								
	D	1	2	18	26	3	6	1	1	2								

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

CHOLERA—Continued

[C indicates cases; D, deaths; P, present]

Place		June 28–July 25, 1931	July 26–Aug. 22, 1931	Aug. 23–Sept. 19, 1931	Sept. 20–Oct. 17, 1931	Week ended— October, 1931		November, 1931				December, 1931				January, 1932		
						24	31	7	14	21	28	5	12	19	26	2	9	16
Indo-China (see also table below):																		
Cochin-China—Rachgia	C		P															
Pnompenh	C	5	2	2	1		2	2										
	D	2	1	2	1													
Saigon and Cholon	C	14			1								P	1		1		
	D	7			1													
Iraq:																		
Abulkhasib	C			6														
	D			5														
Amara	C		2	66	4	2			3	3				2	P			
	D		1	59	1	1			2	4				2				
Amara Province	C			96	95	13	7	15			3							
	D			120	83	10	6	8			2							
Basra	C		547	293	157	38	30	9	1									
	D		287	154	84	7	18	10	1									
Basra Province	C		5	53	42	3	7											
	D		2	30	19	1	4											
Dinwaniyah	C				1													
Dinwaniyah Province	C				61	22	1											
	D				44	10	5											
Iwaniyah	C				23													
	D				15													
Kut Province	C						17	3										
	D						12	2										
Muntafiq Province	C			225	209	17	19	9	23	1	1							
	D			145	160	10	18	6	17	3								
Nasiriyah	C			88	33	4	7	6	7	2	6							
	D			75	28	3	6	3	6		7							
Suqelshuyukh	C			2														
	D			2														
Japan: Taiwan—Kelung	C							2										
Persia:																		
Abadan	C				1		3			1								
Ahwaz	C				12		84	16	3		9	37	1					
	D				7		69	21	8		7	31	1					

Khorramabad

Khorramabad	C									18	16	80	45	2	1			
	D									10	10	65	30	9	1			
Mohammerah	C				1													
Philippine Islands: [2]																		
Provinces—																		
Capiz	C			35	79		7	5			4	16	7	13	4	4	5	
	D			16	59		5	4			4	10	5	10	3	3	3	
Cebu	C		3											—				
	D		3											—				
Iloilo	C	27																
	D	25																
Siam	C	3	1	1														
	D	1		1														
Ayudhaya Province	C												1					
	D												1					
Bangkok	C	4	1	1														1
	D	2																1
On vessel:																		
S. S. Bandar Shalpour, at Bushire, Persia, from Basra	C	1																
	D	1																
S. S. Kohistan, at Basra, from Bushire, Persia	C	2																
S. S. Cathay, at Kobe, Japan, from Shanghai	C		4															
	D		1															
S. S. Kasagi Maru, at Moji, from Shanghai	C			1														
S. S. Ankoo, at Nagasaki, from Shanghai	C			2														
	D			1														

[1] On Oct. 23, 1931, cholera was reported at Mohammerah, Abadan, and Ahwaz, Persia. During the period from Oct. 22 to Nov. 7, 1931, 141 cases and 97 deaths were reported
[2] Figures for cholera in the Philippine Islands are subject to correction.

Place		June, 1931	July, 1931	August, 1931	September, 1931			October, 1931			November, 1931			Dec. 1–10, 1931
					1–10	11–20	21–30	1–10	11–20	21–31	1–10	11–20	21–30	
Indo-China (French) (see also table above):														
Cambodia [1]	C	308	241	12		8	6	1	16	2	3		1	
	D	109	60	2		4	3	1	16	1				
Cochin-China [1]	C	140	143	39		9	9	11	2	1	5		1	8
	D	106	42	32		6	7	10	2	1	4			5

[1] Reports incomplete.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE

[C indicates cases; D, deaths; P, present]

Place		June 28–July 25, 1931	July 26–Aug. 22, 1931	Aug. 23–Sept. 19, 1931	Sept. 20–Oct. 17, 1931	Week ended— October, 1931		November, 1931				December, 1931				January, 1932		
						24	31	7	14	21	28	5	12	19	26	2	9	16
Algeria:																		
Algiers	C		2															
Philippeville	C	1	2															
	D	1	1															
Argentina: San Juan Province	C	P																
Azores:																		
San Miguel Island	C										2	3						
	D											1						
Terceira Island	C										9	7						
	D										4	2						
British East Africa (see also table below):																		
Tanganyika	C	6	8	4	13													
	D	6	2	4	5													
Uganda	C	418	285	289	276	71		87	60	41	38							
	D	400	281	207	270	69		84	58	39	35							
Ceylon: Colombo	C	1	6	3	4						1						4	
	D	1	6	3	3						1						4	
Plague-infected rats			8									1						
Chile: Santiago	C				1													
	D				1													
China: [1]																		
Shansi Province [2]	C						P											
Shensi Province	C						P											
Dutch East Indies:																		
Batavia and West Java	C	75	58	65	113	28	34	38	39	44								
	D	75	58	65	113	28	34	38	39	44								
Java and Madura	D	212	205	233	325	97	133	132	150	152	171	167						
Ecuador (see table below).																		
Egypt:																		
Alexandria	C	13	9	5	1	1	1	3	1		1	1	1					1
	D	5	3	2				1	1	1	1	1						
Assiout	C												1	1	1			
	D													1	1			
Behéira	C			2														

Dakahlia	C	1	2															
Girga	C	1								1		1		1				
	D									1		1		1				
Kena	C									2			2			1	1	
	D									1			2			1	1	
Minieh	C	12						1	3			1	1	1		3	3	
	D	4						1	1					1		3	3	
Port Said	C	5	2			1			1	2		2			1			
	D	1								2					1			
Tanta	C		2	2						2								
	D									2								
France: Rouen—Devilleles	C						P											
Hawaii Territory:																		
Hawaii—Hamakua—Plague-infected rats			1															
Maui Island—																		
Haliimaile—Plague-infected rats				1														
Kula District	C		1															
	D		1															
Makawao—Plague-infected rats				1														
Paia—Plague-infected rats					1													
Paaulo—Plague-infected rats							1											
India	C	221	684	1,832	2,550	619	625	600										
	D	128	440	772	1,147	304	287	262										
Bassein	C	4	2	4	1	1												
	D	3	2	4	1	1												
Bombay	C	12			1	1					1							
	D	6			1						1							
Plague-infected rats		48	47	57	42	4		11	7	11	13	16	16	17	7			
Burma	C	16																
	D	10																
Madras Presidency	C	21	28	376	185		23	49	19	26	31							
	D	9	24	162	105		16	17	7	14	10							
Moulmein	C	9		5														
	D	1		9	2													
Rangoon	C	2	1	3		5				1					1			
	D	1	1	2		1				1					1			
Plague-infected rats		6	3	4	4	1						1	1					
Indo-China (see table below).																		
Iraq:																		
Baghdad	C	3	1	3			1		1	1	2	1	3	1			1	2
	D	2		1						1		1						
Maudhan	C							2	1	1	1							
	D							1		1								
Madagascar (see also table below): Tamatave	C		1	2	1										1			
Morocco	C				18		2					11						
	D				8	2	4											
Peru (see table below).																		

[1] On July 27, 1931, 1,250 cases of plague were reported in Chiobe and Changchow, China, since April. On Sept. 19, 1931, 18 deaths were reported in Changchuanpu and new cases in Kaitung and Fengtien.

[2] On Oct. 17, 1931, plague epidemic was reported in western Shansi Province, China, with 2,000 deaths at Hsinghsien.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE—Continued

[C indicates cases; D, deaths; P, present]

Place		June 28–July 25, 1931	July 26–Aug. 22, 1931	Aug. 23–Sept. 19, 1931	Sept. 20–Oct. 17, 1931	Week ended— October, 1931		November, 1931				December, 1931				January, 1932		
						24	31	7	14	21	28	5	12	19	26	2	9	16
Senegal (see table below).																		
Siam	C		1	4	4	1		4		1	3	1		1				
	D			3	3	1		1			1	1		1				
Spain: Hospitalet—Barcelona Province	C		5	2	2	5		1	1									
	D		2	1	1	1												
Syria: Beirut	C	2	1	2	3			1										
Tunisia: Tunis	C			1	1													
Union of South Africa:																		
Cape Province—Plague-infected rats			1															
Orange Free State	C			P	P					P								

Place		June, 1931	July, 1931	August, 1932	September, 1931	October, 1931	November, 1931
British East Africa (see also table above):							
Kenya	C	154	484	235	14	64	15
Ecuador:							
Alamor Parish—Los Hoyos	C	------	------	------	1	3	------
Amaluza Parish—Cangochapa	C	------	------	------	------	2	------
Calvas Canton—							
Cariamanga	C	------	------	------	4	1	------
Ovejeria	C	------	1	------	------	------	------
Celicia Canton—Choras	C	------	------	------	------	1	------
Loja Canton—							
Lapaz	C	------	------	------	20	------	------
Naimuro	C	------	------	------	------	2	------
Paterillo	C	------	1	------	------	------	------
Tuburo	C	------	------	------	------	7	------
Palas Canton—San Antonio	C	------	------	------	1	1	------
Indo-China	C	2	1	------	4	3	------
	D	2	1	------	4	1	------
Madagascar (see also table above):							
Ambositra Province	C	15	1	2	1	8	------
	D	15	1	1	1	5	------
Antisirabe Province	C	12	13	22	19	17	------
	D	12	12	22	19	17	------
Miarinarivo Province	C	------	8	20	14	18	------
	D	------	7	19	12	16	------
Moramanga Province	C	1	1	3	12	13	------
	D	------	------	3	11	11	------
Tananarive Province	C	10	5	45	65	120	------
	D	9	5	44	63	117	------
Peru	C	5	3	19	2	------	------
	D	1	2	14	2	------	------
Barranca—Chancay	C	------	------	------	------	------	4
	D	------	------	------	------	------	1
Callao—Plague-infected rats		------	------	1	------	------	------
Chepen—Pacasmayo	C	------	------	------	------	------	1
	D	------	------	------	------	------	1

Place		June, 1931	July, 1931	August, 1931	September, 1931	October, 1931	November, 1931
Peru—Continued.							
Eten—Chiclayo	C	------	------	------	1	------	------
	D	------	------	------	1	------	------
Huancabamba—Ayacaba	C	------	------	------	------	7	------
	D	------	------	------	------	6	------
Huaura—Chancay	C	------	------	------	1	------	------
	D	------	------	------	1	------	------
Plague-infected rats		------	------	------	------	1	------
La Samana—Hualgayoc	C	------	------	------	------	------	4
Lima—Lima	C	------	------	------	------	------	1
	D	------	------	------	------	------	1
Lima—Lima (haciendas)	C	------	------	------	------	------	2
	D	------	------	------	------	------	1
Paijan—Trujillo	C	------	------	------	------	------	1
Palulo—Hualgayoc	C	------	------	------	------	------	10
	D	------	------	------	------	------	5
Patrovilca—Chancay	C	------	------	------	------	------	1
	D	------	------	------	------	------	1
Quispampa—Huancabamba	C	------	------	------	------	1	------
	D	------	------	------	------	1	------
San Pedro—Pacasmayo	C	------	------	------	------	------	1
Supe—Chancay	C	------	------	------	------	------	2
	D	------	------	------	------	------	1
Senegal:							
Baol [1]	C	------	27	101	13	6	2
	D	------	13	58	8	2	------
Dakar [1]	C	64	95	194	45	4	------
	D	56	73	106	31	4	------
Diourbel [1]	C	------	------	------	13	------	10
	D	------	------	------	5	------	5
Louga [1]	C	4	3	2	10	1	19
	D	2	1	1	4	2	10
Rufisque [1]	C	2	34	2	1	7	12
	D	------	------	------	------	1	2
Thies [1]	C	12	16	26	12	7	16
	D	3	7	16	8	5	7
Tivaouane [1]	C	3	3	------	------	------	------
	D	2	2	------	------	------	------

[1] Reports incomplete.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX

[C indicates cases; D, deaths; P, present]

Place		June 28–July 25, 1931	July 26–Aug. 22, 1931	Aug. 23–Sept. 19, 1931	Sept. 20–Oct. 17, 1931	Week ended— October, 1931		November, 1931				December, 1931				January, 1932	
						24	31	7	14	21	28	5	12	19	26	2	9
Algeria:																	
Algiers	C	1						1						1			
Constantine	C	1		1													
Brazil: Porto Alegre (alastrim)	C	41	34	48	46	7	24	3	23	9	8	15	19				
	D	1	1	4	2		3					1					
British East Africa: Tanganyika	C	149	19	50	1,184		18			2							
	D	17		5	97		2										
British South Africa:																	
Northern Rhodesia	C	21	26		1												
Southern Rhodesia	C	2		3													
Canada:																	
Alberta	C	1	1		12	1	2	2	1		2	1		9			
British Colombia	C	2	5	2				1	1								
Manitoba	C			1						1	1						
Winnipeg	C			1													
Nova Scotia	C										1						
Ontario	C	35	5	6	17		7	3	5	3	2	5	1	10		2	
Kingston	C			1													
Ottawa	C			1	8		4	3	5								
Toronto	C										1						
Quebec	C	1														2	1
Saskatchewan	C	42	26	33	11	11	3	1	18	12	5	9	8			1	
Regina	C				2												
Chile:																	
Antofagasta	C	1															
Santiago	C					2	1										
	D					1	1										
Tocopilla	C															2	
China:																	
Amoy	C	2	1	1	2	1		1	6	2	5	11	28	60	66	49	43
	D	2	1	1	1	1		1	4		4	7	25	22	20	19	18
Canton	C	2		1				1	1	6	3	2	3	6	3		
Foochow	C	P	P	P	P		P		P		P		P				
Hankow	C	3	3		1		5	4	9	5	8	11	5				
	D										4		2				

Manchuria—Dairen	C										1						
Nanking	C		1														
Shanghai—																	
Foreigners only	C	3		35	64	6	2	12	16	13	20	23	16	16	40	18	
Including natives	D	6	1	7	8		1	1		6	8	7	8	8	13	6	
Tientsin	C	3															
Chosen (see table below).																	
Colombia:																	
Cali	C													1			
Santa Marta	D			1													
Eritrea	C	2		10													
	D			2													
France (see table below).																	
Great Britain:																	
England and Wales	C	187	91	97	161	39	42	71	68	55	56	57	48	44	32		
London	C	54	26	32	58	20	27	55	27	38	27	35	18	18	14		
London and Great Towns	C	152	69	88	128	31	37	66	45	48	48	53	42	31	22		
	D	1															
Sheffield	C			2													
Greece (see table below).																	
Honduras:																	
Ceiba	C				14												
Puerto Castilla	C				1				1					1			
Tegucigalpa	C										8						
Trujillo	C			1	1												
India	C	5,359	2,927	1,705	1,451	197	270	378	307								
	D	1,352	746	433	224	46	66	63	71								
Bombay	C	6	2	5						1				2			
	D	6	1	1						1				1			
Calcutta	C	21	13	5	1	1						1			1		
	D	18	9	5	1	1											
Cochin	C		3		8	3		2				1			1		
Karachi	C		1			1											
Madras	C	2	1	1	13	2	2		1		2	2	3	1	2		
	D				2						1		1		1		
Negapatam	C	1	2	4	2				1				1				
	D				1				1				1				
Rangoon	C	3	4	2	3	1	1	1		2	2	2	3	4	4		
	D	1	2	1	2			1		2	2	1	2	1			
Tuticorin	C			2	4	1		4			4	4		2			
	D				1	1											
Vizagapatam	C	5	5	6	6												
	D	1	4	6	1												
India (French):																	
Chandernagor	C	3															
	D	2															
Karikal	C	4	7	7	8			3	1	1		2	4				
	D	4	6	3	4			3		1		2	4				
Pondicherry Province	C	28	20	26	23	9	18	5	6	9	6	5	6				
	D	28	20	24	21	9	16	5	6	9	5	5	6				

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX—Continued

[C indicates cases; D, deaths; P, present]

Place		June 28–July 25, 1931	July 26–Aug. 22, 1931	Aug. 23–Sept. 19, 1931	Sept. 20–Oct. 17, 1931	Week ended— October, 1931: 24	31	November, 1931: 7	14	21	28	December, 1931: 5	12	19	26	January, 1932: 2	9
Indo-China (see also table below): Saigon and Cholon	C	3	2	6	6	----	4	2	1	4	6	7	9	13	8	3	----
	D	1	1	3	3	----	4	1	----	2	1	3	6	9	6	2	----
Iraq:																	
Baghdad	C	----	----	1	----	----	----	----	----	----	1	4	6	3	4	4	4
	D	----	----	----	----	----	----	----	----	----	1	2	2	1	2	2	3
Basra	C	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	1
	D	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	2
Mosul Liwa	C	1	1	----	5	----	----	----	----	----	----	----	----	----	----	----	----
Ivory Coast (see table below):																	
Jamaica	C	----	----	----	----	----	----	----	----	----	----	1	----	----	----	----	----
Japan: Yokohama	C	----	----	----	----	----	----	----	----	----	1	----	----	----	----	----	----
Mexico (see also table below):																	
Jalisco (State)—Guadalajara	D	3	2	----	4	----	----	2	----	1	----	----	----	1	----	----	----
Mexico City and surrounding territory	C	22	10	5	7	1	1	1	2	3	4	2	1	----	----	----	----
	D	8	2	2	4	1	----	----	----	----	----	----	----	----	----	----	----
Monterrey	C	----	----	----	----	----	2	----	----	----	----	----	----	----	----	----	----
Torreon	C	----	----	2	1	----	----	----	----	----	1	5	1	----	----	----	----
	D	----	----	1	----	----	----	----	----	----	----	----	----	----	----	----	----
Morocco (see table below).																	
Netherlands: Friesland—Opsterland	C	----	----	----	----	[1]1	----	----	----	----	----	----	----	----	----	----	----
Nigeria	C	----	----	----	454	----	8	61	----	----	----	----	----	----	----	----	----
	D	----	----	----	141	----	----	15	----	----	----	----	----	----	----	----	----
Panama: Chiriqui	C	----	----	----	----	----	----	----	----	----	----	3	----	----	----	----	----
Poland	C	18	----	1	----	----	1	----	1	----	----	----	1	1	----	----	----
Portugal:																	
Lisbon	C	45	37	66	48	19	16	17	26	22	23	21	25	35	14	----	----
Oporto	C	----	1	----	----	----	----	----	----	----	1	----	1	1	----	----	----
Rumania (see table below).																	
Siam	C	1	----	3	----	----	----	----	----	----	----	----	----	----	----	----	----
	D	1	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Spain	C	7	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Straits Settlements	C	----	1	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Sudan (Anglo-Egyptian)	C	----	----	32	----	----	----	----	----	2	----	----	----	----	----	2	----
	D	----	----	6	----	----	----	----	----	----	----	----	----	----	----	----	----
Syria (see table below).																	
Turkey (see table below).																	

Place		June, 1931	July, 1931	August, 1931			September, 1931			October, 1931			November, 1931			Dec. 1–10, 1931
				1–10	11–20	21–31	1–10	11–20	21–30	1–10	11–20	21–31	1–10	11–20	21–30	
Indo-China (see also table above)	C	47	8	29	13	30	5	7	27	10	11	26	20	2	98	144
	D		4	11	6	9		4	8	3	3	10	4		18	17
Ivory Coast	C					7							1			
	D					4							1			
Syria: Beirut	C	1														

Place		May, 1931	June, 1931	July, 1931	August, 1931	September, 1931	October, 1931	November, 1931
China: Harbin	C	13	10					
Chosen	C	1	4	2				2
	D			1				
France	C	54	9	20		4		6
Greece	C	3	1					
Mexico (see also table above)	D	1	2					
Morocco	C	49	48	23	23	59	91	152
Rumania	C	1			1			
Turkey	C	9	1					
Union of Socialist Soviet Republics	C	1,345						

[1] Imported case.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

TYPHUS FEVER

[C indicates cases; D, deaths; P, present]

Place		June 28–July 25, 1931	July 26–Aug. 22, 1931	Aug. 23–Sept. 19, 1931	Sept. 20–Oct. 17, 1931	Week ended— October, 1931		November, 1931				December, 1931				January, 1932	
						24	31	7	14	21	28	5	12	19	26	2	9
Algeria:																	
Algiers	C	2			1		1	1						1			
Bone	C		2														
Constantine Department	C	3	1	2	1		11	16	11	1		1	1	1			
Oran	C		1	1					1	1							
Bulgaria	C			1		1			1		2						
Chile:																	
Antofagasta	C						1										
Santiago	C					3	19										
China:																	
Manchuria—Harbin	C			1													
Shanghai	C	3	1		1												
Chosen (see table below).																	
Colombia: Cali	D			1													
Czechoslovakia (see table below).																	
Egypt:																	
Alexandria	C			2				1						3		1	
Beheira	C																
Cairo	C			1									1				
Gharbieh	C							1									
	D							1									
Greece (see table below).																	
Guatemala (see table below).																	
Irish Free State:																	
Cork County—																	
Schull	C	1															
Skibbereen	C	1															
Donegal County—Stranorlar	C												2				
Limerick County—																	
Croom	C				1												
Glin	C			2	1												
Limerick	C	2	1										1				
Michelstown	C	1															
Rathkeale	C				1												
Mayo County—																	
Castlebar	C																

Mayo County—																		
Castlebar	C			1														
Westport	C			1														
Waterford County—Lismore	C																1	
Lithuania (see table below).																		
Mexico:																		
Durango	D	1																
Guadalajara	D		1															
Mexico City, including municipalities in Federal District	C	53	18	10	14	7	3	1	5	7	3	5	7	4	3			
	D	12	10	4	8	2	2			1	1	1	1	2	1			
San Luis Potosi	D	4	1												1			
Torreon	C	1			2		3											
	D	1			2		5	1										
Morocco	C	102	8		4		1					11	6	4	1			
	D	8											2	1				
Palestine	C	2	11	4	6	2		1			1			2	1		1	
Paraguay: Asuncion	D			1														
Peru.[1]																		
Poland	C	53	31	11	14	2	6	6	6	16	36	32	22	68				
	D	5	2		1		1	2		2	2		6	5				
Portugal: Oporto	C						3											
Rumania	C	11	23	13	18	12	12	6	8	13	13							
	D	5	2	1	3	3	3	2	1	1	1							
Tunisia: Tunis	C	2		3					3		26				1			
	D										2							
Turkey (see table below).																		
Union of Socialist Soviet Republics (see table below).																		
Union of South Africa:																		
Cape Province	C	P	P	P	P	P	P	P	P		P	P						
Municipality of East London	C			P														
Natal	C	P	P	1	P			P			P	P						
Orange Free State	C	12			P	P	P	P										
Transvaal	C	P	P	P	1	P	P	P	P	P	P	P						
Yugoslavia (see table below).																		

Place		May, 1931	June, 1931	July, 1931	August, 1931	September, 1931	October, 1931	November, 1931
Chosen: Seoul	C		6	1				4
	D		1	1				1
Czechoslovakia	C	11	2				18	
Greece	C	6	9	2	13	9	12	
	D				2	1		
Guatemala	C		33	34	3			
	D		15	5				

Place		May, 1931	June, 1931	July, 1931	August, 1931	September, 1931	October, 1931	November, 1931
Lithuania	C	10	13	8	2		5	
	D		2				1	
Turkey	C	13	11	9		16	1	14
Union of Socialist Soviet Republics	C	1,324						
Yugoslavia	C	14	2	3	1			

[1] Typhus fever has been reported in Peru from May to November, 1931, 153 new cases being reported during the months of October and November. The disease has not spread to the coastal regions.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

YELLOW FEVER

[C indicates cases; D, deaths; P, present]

Place		May 31–June 27, 1931	June 28–July 25, 1931	July 26–Aug. 22, 1931	Aug. 23–Sept. 19, 1931	Week ended— Sept. 26, 1931	October, 1931					November, 1931				December, 1931	
							3	10	17	24	31	7	14	21	28	5	12
Brazil:																	
Alagoas State	C			3													
	D			2													
Maceio	C											1					
Utinga	C											3					
	D											2					
Ceara State	C	1		1													
	D			1													
Sobral	C										1						
	D										1						
Pernambuco State	C				2												
	D				2												
Pau d'Alho	C												1				
	D												1				
Recife	C					1											
	D					1											
Sergipe State	C	1															
British Cameroons: Mamfe	C	2															
Colombia: Magdalena Province—Near Cienaga	C		4														
Gold Coast:																	
Akuse	C		2														
	D		1														
Dagomba District	C			4													
Kete Krachi	C							1									
Kintampo	C		1														
	D		1														
Oda	C				1												
	D				1												
Salaga	C															1	
	D															1	
Tamale	C		2			2				1					2	1	
	D		2			2											
Wale Wale	C			1													
	D			1													
Ivory Coast:																	

Ivory Coast:																		
Bobo Dioulasso	C		1															
	D		1															
Grand Bassam	C			4	1													
	D			2	1													
Kong Circle	C		4															
Seguela	C			P														
Tehini	C																	
Nigeria	C			1							1		1					
	D			1										1		2		
Senegal:														1		2		
Podor (Hinterland)	C			1														
	D			1														
St. Louis	C					1												
Thies	C					1												
	D					1												
Sudan (French)	C		4															
Macina—Kayo Circle	C													2				
	D													2				
Togo (French): Atakpame—Anie Circle	C												1					1
	D												1					
Upper Volta:																		
Banfora	C		2			2												
	D		1			1												
Dedougou	C										2							
Diarabakoko	C					2												
	D					1												
Ouagadougou	C				1	1			1									

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